STUDY & EVALUATION SCHEME

OF

B.Sc. FORENSIC SCIENCE

(BFS)

[Applicable W.E.F. Academic Session - 2019-20 Till Revised]

[As per CBCS guidelines given by UGC]

TEERTHANKER MAHAVEER UNIVERSITY

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TEERTHANKER MAHAVEER UNIVERSITY
(Established Under Govt. of U.P. Act No. 30,
(2008) Delhi Road, Bagadpur, Moradabad (U.P.)

STUDY & EVALUATION SCHEME	
SUMMARY	
INSTITUTE NAME	Teerthanker Mahaveer University, College of Paramedical Sciences, Delhi Road, Moradabad
PROGRAMME	B.Sc. Forensic Science
DURATION	Three Years Full Time (Six Semesters)
MEDIUM	English
MINIMUM REQUIRED ATTENDANCE	75%
TOTAL CREDITS	
CREDITS	155

PROGRAMME OUTCOMES (PO): On completion of the Programme, the student will be: -

PO1.	Understanding ways of functioning effectively as an individual independently and as a member in diverse team in multidisciplinary settings (**Attitude).**
PO2.	Understanding requirements of continuous education as a function of growth and maintenance of professional competence **(Lifelong learning**).
PO3	Understanding environmental consciousness and societal concerns in achieving sustainable development (**Environment and Sustainability**).
PO4.	Applying computer skills in health care system and taking entrepreneurial decisions (**Entrepreneurship**).
PO5.	Applying knowledge to assess societal, health, safety and legal issues related to Professional practice (**Social interaction & effective citizenship**).
PO6.	Applying systematized problem solving techniques to identify and correct procedural errors to verify the accuracy of laboratory result obtained.(**Problem analysis and solving**).
PO7.	Applying appropriate techniques, resources and tools with an understanding of limitations (**Technology savvy/usage).**
PO8.	Executing professional conduct and interpersonal communicational skills effectively with society at large (**Communication**).

ASSESSMENT						
Evaluation			**Internal**		**External**	**Total**
Theory			40		60	100
Practical/ Dissertations/Viva-Voce			50		50	100
Class Test-1	**Class Test-2**	**Class Test-3**	**Assignment(s)**		**Attendance & Participation**	**Total**
Best two out of three						
10	10	10	10		10	40

Practical Evaluation (50 marks)	**Experiment**	**File work**	**Viva**	**Attendance**	**Total**
Internal Practical	30	5	5	10	50
External Practical	30	10	10	-	50

Duration of Examination	**External**	**Internal**
	3 Hours	1.5 Hours

INTERNAL PRACTICAL EVALUATION (50 MARKS)

The internal evaluation would also be done by the internal examiner based on the experiment performed during the internal examination.

During Semester				**On the day of Examination**	
Experiment	**File Work**	**Viva Voce**	**Attendance**	**Experiment**	**Viva Voce**
5 Marks	**10 Marks**	**10 Marks**	**10 Marks**	**5 Marks**	**10 Marks**

EXTERNAL PRACTICAL EVALUATION (50 MARKS)

The external evaluation would also be done by the external examiner based on the experiment performed during the external examination.

Experiment	**File Work**	**Viva Voce**	**Total Experiment**
30 Marks	10Marks	10 Marks	50 Marks

To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester examination and teacher's continuous evaluation. (i.e. both internal and external). A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have secured at least 50 CPI in aggregate to clear the Programme.

	QUESTION PAPER STRUCTURE
1.	The question paper shall consist of six questions, out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question no. 2 to 6 (from Unit-I to V) shall have explanatory answers (approximately 350 to 400 words) along with having an internal choice within each unit.
2.	Question No. 1 shall contain 8 parts from all units of the syllabus with at least one question from each unit and students shall have to answer any five, each part will carry 2 marks.
3.	The remaining five questions shall have internal choice within each unit; each question will carry 10 marks.
	IMPORTANT NOTES
1.	The purpose of examination should be to assess the Course Outcomes (COs) that will ultimately lead to assessment of attainment of Programme Outcomes (POs). A question paper must assess the following aspects of learning: Remember, Understand, Apply, Analyze, and Evaluate & Create (reference to Bloom's Taxonomy).
2.	Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. All courses may not have case teaching method used as pedagogy.
3.	There shall be continuous evaluation of the student and there will be a provision of fortnight progress report.

TRAINING

Training is compulsory for the students of B.Sc. in Forensic Science so that they would be able to work under the guidance of professional forensic experts and develop new practical approach, skills and knowledge, which would help in finding that post-college job.

1. Training will be accepted for 30 days during the month of June -July for the students of fourth semester.
2. Application for the training should be properly forwarded and recommended by the Dean/Director/Head of department of the respective institution/ organization to Forensic Science Laboratories.
3. The Trainee shall maintain the record of work, which is to be verified and certified by the Scientific Officer/Technician under whom he /she works. Apart from scrutiny of record of work, assessment and evaluation of training shall be undertaken by an objective approach using situation tests in knowledge, skills and attitude after at the end of training by the Head of the Department.

ENGLISH EVALUATION SCHEME FROM I-IV SEMESTER

Internal Evaluation			External Evaluation		Total Marks
40 Marks			60 Marks		100
20 Marks (Best 2 out of Three CTs)	10 Marks (Oral Assignments)	10 Marks (Attendance)	40 Marks (External Written Examination)	20 Marks (External Viva)*	

PARAMETERS OF EXTERNAL VIVA FOR I SEMESTER

Content	Body Language	Confidence	Question Responsiveness	TOTAL
05 Marks	**05 Marks**	**05 Marks**	**05 Marks**	**20 Marks**

PARAMETERS OF EXTERNAL VIVA FOR II-IV SEMESTERS

Content	Body Language	Communication skills	Confidence	TOTAL
05 Marks	**05 Marks**	**05 Marks**	**05 Marks**	**20 Marks**

Note: External Viva will be conducted by 2-member committee comprising

i) One Faculty teaching the class
ii) One examiner nominated by University Examination cell.
iii) Each member will evaluate on a scale of 20 marks and the average of two would be marks obtained by the students.

DISSERTATION EVALUATION

S.No	Course code	Course name	Evaluation scheme		
			Internal	External	Total
1.	BFS-S-655	Dissertation	50	50	100

INTERNAL EVALUATION

Internal marks will be given on the basis of the following criteria:

	Presentation	Attendance	Viva	Log book	Total
Internal	20	10	10	10	50

EXTERNAL EVALUATION

External marks will also be given by the external examiner on the basis of the following criteria:

	Presentation	Project report	Viva	Total
External	20	20	10	50

PROGRAM STRUCTURE- FORENSIC SCIENCE

A. INTRODUCTION

With the advancements in Forensic Science and technology, law enforcement agencies have more resources to deal with the criminals and their actions, as a result the demand for Forensic Science has increased. Forensic Science students should be equipped to work across time zones, languages, and cultures. Employability, innovation, theory to practice connectedness is the central focus of this curriculum. The curriculum is designed as such that the students can gain an in-depth mastery of the academic disciplines and applied functional areas necessary to meet the requirements of Law Enforcement Agencies.

The College emphasizes balance with core and elective courses mentioned in succeeding paragraph: The curriculum of Forensic Science program emphasizes an intensive, flexible education with 44 credits of Core Courses (all types), 36 credits of Discipline specific course and 30 Discipline specific electives course, and 4 credits of Dissertations. Total 155 credits are assigned to B.Sc. Forensic Science. The programme structure and credits for Forensic Science are finalized based on the stakeholders' requirements and general structure of the programme. However, the maximum number of the credits for award of BFS degree will be 154 credits. Out of which 118 credits of classroom contact teaching, 44 credits are to be allotted for Core Courses (CC), 36 credits of Discipline Specific Courses (DSC) and 30 Discipline Specific Electives Courses (DSEC), 16 credits are allotted to Ability Enhancement Courses (AECC), 3 credits are allotted to open/Generic Elective Courses (GEC).

A course handout is a thorough teaching plan of a faculty taking up a course. It is a blueprint which will guide the students about the pedagogical tools being used at different stages of the syllabus coverage and more specifically the topic-wise complete plan of discourse, that is, how the faculty members treat each and every topic from the syllabus and what they want the student to do, as an extra effort, for creating an effective learning. It may be a case study, a role-play, a classroom exercise, an assignment- home or field, or anything else which is relevant and which can enhance their learning about that particular concept or topic. Due to limited availability of time, most relevant topics will have this kind of method in course handout.

Contact hours include work related to Lecture, Tutorial and Practical (LTP), where our institution will have flexibility to decide course wise requirements.

B.SC FORENSIC SCIENCE (SIX-SEMESTER)CBCSPROGRAMME			
BASIC STRUCTURE: DISTRIBUTION OF COURSES			
S.No.	**Type of Course**	**Credit Hours**	**Total Credits**
1	**Core Course (CC)**	**11 Courses of 4 Credit Hrs. each (Total Credit Hrs. 11 x 4)**	**44**
2	**Discipline Specific Course (DSC)**	**9 Courses of 4 Credit Hrs. each (Total Credit Hrs. 9 x 4)**	**36**
3	**Discipline Specific Elective Course (DSEC)**	**6 Courses of 4 Credit Hrs. each (Total Credit Hrs. 6 x 4)** **6 Courses of 1 Credit Hrs. each (Total Credit Hrs. 6 x 1)**	**30**
4	**Ability-Enhancement Compulsory Course (AECC)**	**4 Courses of 3 Credit Hrs. each (Total Credit Hrs. 4 x 3)** **1 Course of 4 Credit Hrs. (Total Credit Hrs. 1 x 4)**	**16**
5	**Skill-Enhancement Elective Course (SEC)**	**1 Course of 4 Credit Hrs. (Total Credit Hrs. 1 x 4)** **18 Courses of 1 Credit Hrs. each (Total Credit Hrs.18 x 1)**	**22**
6	**Open Elective Course (OEC)**	**1 Course of 3 Credit Hrs. (Total Credit Hrs. 1 x 3)**	**3**
7	**Value Added Course (VAC)**	**2 Courses of 0 Credit Hrs. each (Total Credit Hrs. 2 x 0)**	**0**
8	**MOOC Course**	**2 Courses of 2 Credit Hrs. each (Total Credit Hrs. 2 x 2)**	**4**
		Total Credits	**155**

B. CHOICE BASED CREDIT SYSTEM (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our University. The following is the course module designed for the B.Sc Forensic Science program:

Core Course (CC): Core courses of Forensic Science program will provide a holistic approach for the strong foundation of a broad multi- disciplined knowledge. Department offer 11 core courses from I to VI Semester during the Forensic Science program. There will be 4 credits for each core course offered.

Program/Discipline Specific Course (DSC): The Discipline specific courses will provide more Practical-based knowledge, case-based lessons and collaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding and develop decision-making ability. A wide range of Discipline specific courses provides groundwork in the basic Forensic Science related disciplines: Fingerprints, documents, ballistic, toxicology etc. The integrated foundation is important for students because it will not only allow them to build upon existing skills, but they can also explore career options in a wide range of Forensic Disciplines. Department offer 9 Discipline specific courses from I semester to VI during the Forensic Science Program. There will be 4 credits for each DSC course offered.

Program/Discipline Specific Elective Course (DSEC): The discipline specific elective course is chosen to make students specialist or having specialized knowledge of a specific domain like Physics & Chemistry. It will be covered in all six semesters of the program relevant to chosen disciplines of the program. The student will have to choose any one group out of the two elective group offered, i.e., Group A, Group B respectively. Each DSEC will carry 4 credits.

Ability Enhancement Compulsory Course (AECC): As per the guidelines of Choice Based Credit System (CBCS) for all Universities, including the private Universities, the Ability Enhancement Compulsory Course (AECC) is a course designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. We offer Total Five AECCs out of which four are compulsory from I to IV Semester with 3 credit each while one AECC will be of 4 credits in only III semester.

Skill Enhancement Course: This course is designed to provide value-based and/or skill-based knowledge. We offer one SECs in VI Semester with 4 credits while there are 18 SECs from I to VI SEM with 01 credit.

Open/Generic Elective Course (GEC): Open/Generic Elective is an interdisciplinary additional subject that is compulsory in any semester of a program. The score of open Elective is counted in Student's overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits and students will have the choice of taking one open elective in Semester IV. Each student has to take Open/Generic Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.

Value Added Course (VAC): A value added audit course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life in the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be one course each in Semester III & Semester IV **will carry no credits, however, it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the Degree certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in these courses in the respective semesters.**

Massive Open Online Course (MOOC): MOOC is an online course aimed at unlimited participation and open access via the web. In addition to traditional course materials, such as filmed lectures, readings, and problem sets, many MOOCs provide interactive courses with user forums or social media discussions to support community interactions among students, professors, and teaching assistants (TAs), as well as immediate feedback to quick quizzes and assignments. MOOCs are a recent and widely researched development in distance education first introduced in 2008 and emerged as a popular mode of learning in 2012. College offer two MOOC courses each of 2 credits in IV & V semesters.

C. PROGRAMME SPECIFIC OUTCOMES (PSOS)

On completion of the Programme, the student will be: -

PSO – 1	Understanding the concepts and tools and techniques of the Sciences (Chemistry, Physics, Biology, Psychology, Computer Science, statistics etc.) Related to Forensic Science and Criminal Justice system.
PSO – 2	Understanding the Need and nature and different divisions of forensic Science, Crime and Criminal law and structural and functional organization of various crime agencies (CBI. INTERPOLE, RAW).
PSO – 3	Understanding the different physical and chemical methods for the Analysis of different physical evidence at the various crime scenes.
PSO – 4	Demonstrating analytical subject specific skills involving the principles, practices and techniques Of specific field.
PSO – 5	Applying major techniques for evidence collection and analysis at crime scene and selecting Appropriate technique.
PSO – 6	Applying quality control, safety measures & maintenance procedure of laboratory equipment.

D. PEDAGOGY & UNIQUE PRACTICES ADOPTED: "Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time- tested lecture method, the institute will **emphasize on experiential learning.**

1. **Case Based Learning:** Case based learning enhances student's skills at delineating the critical decision dilemmas faced by organizations, helps in applying concepts, principles and analytical skills to solve the delineated problems and develops effective templates for criminal justice system issues. Case method of teaching is used as a critical learning tool for effective learning and we encourage it to the fullest.

2. **Role Play & Simulation:** Role-play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play& simulation exercises such as virtual share trading, marketing simulation etc. are being promoted for the practical-based experiential learning of our students.

3. **Video Based Learning (VBL) & Learning through Movies (LTM):** These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video- based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during

Their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM, wherever possible.

4. **Field / Live Projects:** The students, who take up experiential projects in different hospitals/health organizations, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

5. **Industrial Visits/ Educational tour:** Industrial visit are essential to give students hands-on exposure and experience of how things and processes work in education. Our college organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

6. **MOOC:** Students may earn credits by passing MOOCs as decided by the college from time to time. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs.

7. **Special Guest Lectures (SGL):** Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific health organizations/domain to make things/concepts clear for a better understanding from the perspective of the health care system. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia from time to time to deliver their vital inputs and insights.

8. **Student Development Programs (SDP):** Harnessing and developing the right talent for the right organizations an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, workshops etc. that may be required as per the need of the student and healthcare trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

9. **Special assistance Programme for slow learners:** Special classes are arranged for slow learners. They are assisted patiently and consistently. Motivation is one of the most essential requirements to help them continue learning. Proper acknowledgement and praise helps the overall development of such student.

10. **Laboratory focused programs:** Establishing collaborations with various law enforcement partners to deliver the Programme on sharing basis. The specific courses are to be delivered by forensic experts to provide practice-based insight to the students.

11. **Orientation program:** Two-week Programme is arranged to introduce students to college services which will support their educational and personal goals. To facilitate initial academic activities, course selection and registration, creating an atmosphere that minimizes anxiety, promotes positive attitude and stimulates excitement for learning. It also helps knowledge of scope, information regarding academic and student service resources and Programme. It provides a welcoming atmosphere for students to meet faculty, staff and continuing students, as well as other new students.

12. **Mentoring scheme:** College are following the mentoring scheme. Every student is provided with a faculty mentor to help him/her in their personal & academic issues. The mentor maintains a register along with the mentor mentee booklet provided to all students. In that book all the details of student are filled and every month 2 times they meet with their mentors. Mentor fills the details of meeting in every student's register and tries to solve the issue and after solving the issue, same is closed in the register.

13. **Career & personal counseling:** College have training and placement cell for career and personal counseling of the students.

14. **Competitive exam preparation:** College provide different subject experts for competitive exam preparation of students.

15. **Extracurricular Activities:** organizing & participation of students in extracurricular activities are mandatory to help students and develop confidence& face audience with care.

16. **Participation in workshop, seminars, writing & presenting paper:** College are encouraging our students to take participate in these types of activities. Most of our students are participating in these types of activities.

17. **Formation of Student clubs, membership & organizing and participating events:** College have student club and our students are taking participate in many events like youth festival and other activities those are performed in our Universities as well as in other Universities participation.

18. **Capability enhancement & development scheme:** College are offering some schemes like soft skill development, remedial coaching, yoga and meditation and personal counseling to enhance the capability and holistic development of the students.

19. **Library visit & Utilization of E-Learning resources:** College encourage our students to go to library and studies there. For this we have provision of Library schedule in our time table so student can use that time to read different boos and use E-library. College have well developed and organized library.

B.SC. FORENSIC SCIENCE CURRICULUM

SEMESTER I

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-1	BFS–S-105	Fundamentals of Forensic Science -I		4	0	0	4	40	60	100
2	CC-2	BFS-S-103	Basics of Biology- I		4	0	0	4	40	60	100
3	CC-3	BFS-S-106	Fundamentals of Computer Science		4	0	0	4	40	60	100
4	AECC-1	TMUGE101	English Communication-I		2	0	2	3	40	60	100
5	DSEC-1	BFS-S-108	Discipline Specific Elective Courses	Group Elective – A	4	0	0	4	40	60	100
		BFS-S-109		Group Elective – B							
6	SEC-1	BFS-S-155	Fundamentals of Forensic Science- I (Lab)		0	0	2	1	50	50	100
7	SEC-2	BFS-S-153	Basics of Biology -I (Lab)		0	0	2	1	50	50	100
8	SEC-3	BFS-S-156	Fundamentals of Computer Science (Lab)		0	0	2	1	50	50	100
9	DSEC-1 Practical	BFS-S-158	Discipline Specific Elective Courses	Group Elective – A	0	0	2	1	50	50	100
		BFS-S-159		Group Elective – A							
Total					18	0	10	23	400	500	900

SEMESTER II

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-4	BFS–S-205	Fundamentals of Forensic Science- II		4	0	0	4	40	60	100
2	CC-5	BFS-S-203	Basics of Biology -II		4	0	0	4	40	60	100
3	CC-6	BFS-S-206	Basics of Digital & Cyber Forensic		4	0	0	4	40	60	100
4	AECC-2	TMUGE201	English Communication-II		2	0	2	3	40	60	100
5	DSEC-2	BFS-S-208	Discipline Specific Elective Courses	Group Elective – A	4	0	0	4	40	60	100
		BFS-S-209		Group Elective – B							
6	SEC-4	BFS-S-255	Fundamentals of Forensic Science -II (Lab)		0	0	2	1	50	50	100
7	SEC-5	BFS-S-253	Basics of Biology -II (Lab)		0	0	2	1	50	50	100
8	SEC-6	BFS-S-256	Basics of Digital & Cyber Forensic (Lab)		0	0	2	1	50	50	100
9	DSEC-2 Practical	BFS-S-258	Discipline Specific Elective Courses	Group Elective – A	0	0	2	1	50	50	100
		BFS-S-259		Group Elective – B							
Total					18	0	10	23	400	500	900

SEMESTER III

S. N	Category	Course Code	Course		Periods L	T	P	Credit	Evaluation Scheme Internal	External	Total
1	CC-7	BFS-S- 303	Forensic Biology-I		4	0	0	4	40	60	100
2	DSC-1	BFS –S-305	Forensic Medicine		4	0	0	4	40	60	100
3	DSC-2	BFS –S-310	Advanced Digital & Cyber Forensic		4	0	0	4	40	60	100
4	AECC-3	TMUGE301	English Communication-III		2	0	2	3	40	60	100
5	AECC-4	BFS-S-306	Environmental Science		4	0	0	4	40	60	100
6	DSEC-3	BFS-S-308	Discipline Specific Elective Courses	Group Elective – A	4	0	0	4	40	60	100
		BFS-S-309		Group Elective – B							
7	SEC-7	BFS-S-353	Forensic Biology-I (Lab)		0	0	2	1	50	50	100
8	SEC-8	BFS-S-355	Forensic Medicine (Lab)		0	0	2	1	50	50	100
9	SEC-9	BFS-S-356	Advanced Digital & Cyber Forensic (Lab)		0	0	2	1	50	50	100
10	DSEC-3 Practical	BFS-S-358	Discipline Specific Elective Courses	Group Elective – A	0	0	2	1	50	50	100
		BFS-S-359		Group Elective – B							
			Total		22	0	10	27	440	560	1000
VALUE ADDED COURSE –I (VAC-I) EVALUATION SCHEME											
1	VAC -1	TMUGS301	Managing Self		2	1	0	0		50	50	100

SEMESTER IV

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-8	BFS-S- 403	Forensic Biology-II		4	0	0	4	40	60	100
2	CC-9	BFS –S-411	Quality Management in Laboratories		4	0	0	4	40	60	100
3	DSC-3	BFS –S-405	Forensic Dermatoglyphics		4	0	0	4	40	60	100
4	DSC-4	BFS –S-410	Applied Digital & Cyber Forensic		4	0	0	4	40	60	100
5	AECC-5	TMUGE401	English Communication-IV		2	0	2	3	40	60	100
6	DSEC-3	BFS-S-408	Discipline Specific Elective Courses	Group Elective –A	4	0	0	4	40	60	100
		BFS-S-409		Group Elective – B							
7	SEC-10	BFS-S-453	Forensic Biology-II (Lab)		0	0	2	1	50	50	100
8	SEC-11	BFS-S-455	Forensic Dertmatoglyphics (Lab)		0	0	2	1	50	50	100
9	SEC-12	BFS-S-456	Applied Digital & Cyber Forensic (Lab)		0	0	2	1	50	50	100
10	DSEC-4 Practical	BFS-S-458	Discipline Specific Elective Courses	Group Elective –A	0	0	2	1	50	50	100
		BFS-S-459		Group Elective – B							
11		MOOC I			-	-	-	2			100
12			Open elective					3	As Per University Guidelines		
			Total		22	0	10	32	440	560	1100
VALUE ADDED COURSE –I (VAC-I) EVALUATION SCHEME											
1	VAC -II	TMUGS401	Managing work and others		2	1	0	0		50	50	100

SEMESTER V

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-10	BFS –S-510	Introduction to Research Methodology		4	0	0	4	40	60	100
2	DSC-5	BFS -S-505	Forensic Ballistic		4	0	0	4	40	60	100
3	DSC-6	BFS –S-507	Serology & DNA typing		4	0	0	4	40	60	100
4	DSC-7	BFS-S-506	Questioned Documents		4	0	0	4	40	60	100
5	DSEC-5	BFS-S-508	Discipline Specific Elective Courses	Group Elective – A	4	0	0	4	40	60	100
		BFS-S-509		Group Elective – B							
6	SEC-13	BFS –S-555	Forensic Ballistic (Lab)		0	0	2	1	40	60	100
7	SEC-14	BFS -S-557	Serology & DNA typing (Lab)		0	0	2	1	50	50	100
8	SEC-15	BFS –S-556	Questioned Documents (Lab)		0	0	2	1	50	50	100
9	DSEC-5 Practical	BFS-S-558	Discipline Specific Elective Courses	Group Elective – A	0	0	2	1	50	50	100
		BFS-S-559		Group Elective – B							
10		MOOC II			-	-	-	2			100
			Total		20		8	26	390	510	1000

SEMESTER VI

S.N	Category	Course Code	Course		Periods			Credit	Evaluation Scheme		
					L	T	P		Internal	External	Total
1	CC-11	BFS –S-603	Technological Methods in Forensic Science		4	0	0	4	40	60	100
2	DSC-8	BFS -S-606	Forensic Toxicology		4	0	0	4	40	60	100
3	DSC-9	BFS –S-604	Forensic Psychology		4	0	0	4	40	60	100
4	DSEC-6	BFS-S-608	Discipline Specific Elective Courses	Group Elective – A	4	0	0	4	40	60	100
		BFS-S-609		Group Elective – B							
5	SEC-16	BFS –S-653	Technological Methods in Forensic Science (Lab)		0	0	2	1	40	60	100
6	SEC-17	BFS -S-656	Forensic Toxicology (Lab)		0	0	2	1	50	50	100
7	SEC-18	BFS –S-654	Forensic Psychology (Lab)		0	0	2	1	50	50	100
8	DSEC-6 Practical	BFS-S-658	Discipline Specific Elective Courses	Group Elective – A	0	0	2	1	50	50	100
		BFS-S-659		Group Elective – B							
9	SEC-19	BFS –655	Dissertation			0	8	4	50	50	100
			Total		20	0	16	24	400	500	900

CORE PAPERS (CC)

S.NO	CODE	COURSE
1	CC-1	Fundamentals of Forensic Science- I
2	CC-2	Basics of Biology- I
3	CC-3	Fundamentals of Computer Science
4	CC-4	Fundamentals of Forensic science- II
5	CC-5	Basics of Biology -II
6	CC-6	Basics of Digital & Cyber Forensic
7	CC-7	Forensic Biology-I
8	CC-8	Forensic Biology-II
9	CC-9	Quality Management in Laboratories
10	CC-10	Introduction to Research Methodology
11	CC-11	Technological Methods in Forensic Science

DISCIPLINE SPECIFIC COURSES (DSC)

S.No	Course Code	Course Title
1.	DSC 1	Forensic Medicine
2	DSC 2	Advanced Digital & Cyber Forensic
3	DSC 3	Forensic Dertmatoglyphics
4	DSC 4	Applied Digital & Cyber Forensic
5	DSC 5	Forensic Ballistic
6	DSC 6	Serology & DNA typing
7	DSC 7	Questioned Documents
8	DSC 8	Forensic Toxicology
9	DSC 9	Forensic Psychology

SKILLENHANCEMENT COURSE (SEC)

S.NO	CODE	COURSE PRACTICLE
1	SEC-1	Practical's based on Fundamentals of Forensic Science- I
2	SEC-2	Practical's based on Basics of Biology- I
3	SEC-3	Practical's based on Fundamentals of Computer Science
4	SEC-4	Practical's based on Fundamentals of Forensic Science- II
5	SEC-5	Practical's based on Basics of Biology- II
6	SEC-6	Practical's based on Basics of Digital &Cyber Forensic
7	SEC-7	Practical's based on Forensic Biology-I
8	SEC-8	Practical's based on Forensic Medicine
9	SEC-9	Practical's based on Advanced Digital & Cyber Forensic
10	SEC-10	Practical's based on Forensic Biology-II
11	SEC-11	Practical's based on Dertmatoglyphics
12	SEC-12	Practical's based on Applied Digital & Cyber Forensic
13	SEC-13	Practical's based on Forensic Ballistics
14	SEC-14	Practical's based on Serology and DNA typing
15	SEC-15	Practical's based on Questioned Documents
16	SEC-16	Practical's based on Technological Methods
17	SEC-17	Practical's based on Forensic Toxicological analysis
18	SEC-18	Practical's based on Forensic Psychology
19	SEC-19	Dissertation

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSEC)

Forensic Science					
Courses offered in I to VI Semester (choose any one Group)					
	GROUP A			**GROUP B**	
S. No	**Course Code**	**Course Title**	**S.NO**	**Course Code**	**Course Title**
1.	BFS-S-108	Inorganic & Organic Chemistry	1.	BFS-S-109	Elements of Modern Physics
2.	BFS-S-208	Physical & Organic Chemistry - I	2.	BFS-S-209	Mechanics
3.	BFS-S-308	Analytical Chemistry	3.	BFS-S-309	Electricity & Magnetism
4.	BFS-S-408	Physical & Organic Chemistry -II	4.	BFS-S-409	Wave & Optics
5.	BFS-S-508	Inorganic & Physical Chemistry - I	5.	BFS-S-509	Thermal Physics
6.	BFS-S-608	Inorganic & Physical Chemistry - II	6.	BFS-S-609	Solid State Physics

DISCIPLINE SPECIFIC ELECTIVE COURSES PRACTICAL (DSEC)					
Courses offered in I to VI Semester (choose any one Group)					
	GROUP A			**GROUP B**	
S. No	**Course Code**	**Course Title**	**S.No**	**Course Code**	**Course Title**
1.	BFS-S-158	Inorganic & Organic Chemistry (Lab)	1.	BFS-S-159	Elements of Modern Physics (Lab)
2.	BFS-S-258	Physical & Organic Chemistry – I (Lab)	2.	BFS-S-259	Mechanics (Lab)
3.	BFS-S-358	Analytical Chemistry (Lab)	3.	BFS-S-359	Electricity & Magnetism (Lab)
4.	BFS-S-458	Physical & Organic Chemistry - II (Lab)	4.	BFS-S-459	Wave & Optics (Lab)
5.	BFS-S-558	Inorganic & Physical Chemistry - I (Lab)	5.	BFS-S-559	Thermal Physics (Lab)
6.	BFS-S-658	Inorganic & Physical Chemistry - II (Lab)	6.	BFS-S-659	Solid State Physics (Lab)

ABILITY ENHANCEMENT COURSE (AECC)

S.No	Code	Course	L	T	P	Credit
Semester I to VI SEM						
1	AECC-1	English Communication-I	2	0	2	3
2	AECC-2	English Communication-II	2	0	2	3
3	AECC-3	English Communication-III	2	0	2	3
4	AECC-5	English Communication-IV	2	0	2	3
Semester III						
5	AECC-4	Environmental Science	4	0	0	4

Note:			
L- Lecture	T- Tutorial	P- Practical	C- Credits
1 L = 1 Hour	1T = 1 Hour	1P = 1 Hour	1 C = 1 Hour L or T 1 C = 2 Hours P

Course Code: BFS-S-105 CC-1	**CORE COURSE FORENSIC SCIENCE SEMESTER-I** **FUNDAMENTALS OF FORENSIC SCIENCE –I**	**L-4 T-0 P-2 C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the concepts, theories, models & techniques and rationale of training in Forensic Science	
CO2.	Discussing the definition, characteristics, classification of Crime, Crime scene and steps involved in Crime Scene and Criminal investigation	
CO3.	Identifying about professional and ethical responsibility of a Forensic Scientist.	
CO4.	Explaining the structural and functional levels of various divisions of forensic laboratory.	
CO5.	Applying the importance of Physical evidences at various Crime Scenes (homicide, suicide, and hanging, hit and run).	
Course Content:		
Unit-1:	**Crime:** Definition of crime, characteristics of crime, classification of crimes. Brief ideas about White collar crime, professional crime, organized crime.	**9 Hours**
Unit-2:	**Crime scene Investigation:** Definition of Crime Scene. Classification of crime Scene: indoor & outdoor, primary & secondary, macroscopic & microscopic crime scene. Significance of crime scene. **Physical evidence –** Definition, types and sources of Physical Evidence. Significance and linkage of physical evidence among crime scene, victim and criminal.	**9 Hours**
Unit-3:	**Basics of Forensic Science**: Introduction, Global History and Scope, Need and Development of forensic science emphasizing on Specific contribution of Scientists in the field of Forensic Science.	**9 Hours**
Unit-4:	**Domains in Forensic Science**: Branches of Forensic Science. Principles of Forensic science, Ethical issue in Forensic Science.	**9 Hours**
Unit-5:	**Organization of Forensic Science Laboratory**: Structure and function of State and regional Forensic Science Laboratory, Central Forensic Science Laboratory Mobile Forensic Science Laboratory. International scenario of FSL.	**12 Hours**
Textbook:	1. B.B. Nanda and R.K. Tiwari, Forensic Science in India: A Vision for the Twenty First Century, Select Publishers, New Delhi (2001).	
References:	1.S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton(2005) 2. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004). 3. http://www.krepublishers.com/forensicscience.html	

CourseCode: **BFS-S-103** **CC-2**	**CORE COURSE** **FORENSIC SCIENCE SEMESTER-I** **BASICS OF BIOLOGY –I**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the anatomy of plant and human skeletal system (including teeth), and morphology of leaves, flowers, stem and root so as to recognize them as biological evidence if present in various crime scenes.	
CO2.	Understanding the concept of biochemical structure and function of bio-molecules such as proteins, fat, nucleic acid, etc., to know their importance in individualization and identification of an individual.	
CO3.	Explaining the classification of angiosperms and gymnosperms and Explaining the mechanical and conducting tissue System of these plants.	
CO4.	Identifying the process of ossification, different types of bones, dental structure of humans, types of teeth and arrangement to apply the knowledge for identification of deceased and criminal investigation.	
CO5.	Describing the Classification of microorganisms and explaining the concept of pure culture and methods to control micro-organisms and their importance in Forensic microbiology.	
Course Content:		
Unit-1:	**Cell biology:** Structure of Plant and animal cell- structural organization and functions of plasma membrane and cell wall, Cellular Organelles.	**5 Hours**
Unit-2:	**Molecular Biology: I**ntroduction, characteristics, chemical structures of Amino acids, proteins, enzymes, nucleic acid, carbohydrates, lipids.	**14 Hours**
Unit-3:	**Plant physiology:** Plant anatomy, morphology of leaves, stem, flowers, roots, mechanical and conducting tissue systems in plants.	**9 Hours**
Unit-4:	**Introduction to osteology and odontology:** Human skeletal system, different types of bones, ossification, Dental structure of humans, types of teeth and arrangement.	**6 Hours**
Unit-5:	**Basics of Microbiology:** Broad classification of microorganisms Concept of pure culture technique, stains and staining techniques. Control of Microorganisms: Physical & Chemical methods of control.	**14 Hours**
Textbook:	1. Text book of Microbiology, Ananth Naryan Pannikar.	
References:	1. Cell Biology, Sixth Edition International, Students Edition, Gerald Karp,Wile Publications 2010 2. Human Anatomy by B.D Chaurasia. 3. https://www.pdfdrive.com/biochemistry-genetics-molecular-biology-e18198970.htmlAlberts, B. et al. Essential Cell Biology, Garland, 3rd edn2009.	

Course Code: **BFS-S-106** **CC-3**	**CORE COURSE** **FORENSIC SCIENCE SEMESTER-I** **FUNDAMENTALS OF COMPUTER SCIENCE**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the basic knowledge about computer science	
CO2.	Understanding the concepts of number system.	
CO3.	Identifying the concepts and implementing logic gate.	
CO4.	Describing the structural and functional importance of different parts of operating system.	
CO5.	Analyzing the different OSI layer of computer network.	
Course Content:		
Unit-1:	**Basics of Computers:** History, Generation & Classification of Computers, Computer organization, components of computers – input output device, CPU, memory-RAM, ROM and external storage devices.	**8 Hours**
Unit-2:	**Data representations:** integers, real, binary, octal hexadecimal & their conversions logic gates – Negation, OR, AND, X OR etc.	**10 Hours**
Unit-3:	**Introduction to Operating System:** Basics of operating system, memory structure, concurrency, scheduling, file system, synchronization and memory management examples of operating systems- Windows and Linux.	**8 Hours**
Unit-4:	**Basics of Networking**- Components, Architecture, networking protocols, types of computer network, network topologies, network security- threats, vulnerabilities, Access control, virus, Trojans etc, security plan and policies.	**12 Hours**
Unit-5:	**Introduction to Internet**: World Wide Web, E-mails, chat, search engines, connectivity. Internet Vs Intranet, virtual private network.	**10 Hours**
Textbook:	**1.** Sinha P.K., Computer Fundamentals, BPB Publishing.	
References:	1. Leon A. &Leon M., Introductions to Computers, Vikas Publications. 2. Price Michael, Office in Easy Steps, TMH Publication 3. https://www.tutorialspoint.com/operating_system/os_pdf_version.htm	

Course Code: **TMUGE101** **AECC-1**	**ABILITY ENHANCEMENT COMPULSORY COURSE** **FORENSIC SCIENCE SEMESTER-I** **ENGLISH COMMUNICATION-I**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	**40 hours**
CO1.	**Remembering and understanding** of the basic of English grammar and vocabulary.	
CO2.	**Understanding** of the basic Communication process.	
CO3.	**Applying** correct vocabulary and tenses in sentences construction.	
CO4.	**Analyzing** communication needs and developing communication strategies using both verbal & non-verbal method.	
CO5.	**Drafting** applications in correct format for common issues.	
CO6.	**Developing** self-confidence.	
Course Content:		
Unit-1:	**Introductory Sessions** 1. Self-Introduction 2. Building Self Confidence: Identifying strength and weakness, reasons of fear of Failure, 3. strategies to overcome Fear of failure	**6 Hours**
Unit-2:	**Basics of Grammar** Parts of Speech Tense Subject and Predicate Vocabulary: Synonym and Antonym *(Practice: Conversation Practice)*	**12 Hours**
Unit-3:	**Basics of Communication** Communication : Process, Types, 7Cs of Communication, Importance & Barrier Language as a tool of communication Non-verbal communication: Body Language Etiquette & Manners Basic Problem Sounds *(Practice: Pronunciation drill and building positive body language)*	**10 Hours**
Unit-4:	**Application writing** Format & Style of Application Writing Practice of Application writing on common issues.	**8 Hours**
Unit-5:	**Value based text reading:** Short Story (Non- detailed study) Gift of Magi – O. Henry	**4 Hours**
Textbook:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi	
References:	1. Carnegie Dale. "How to Win Friends and Influence People" New York: Simon & Schuster. 2. Goleman, Daniel. "Emotional Intelligence" Bantam Book. 3. https://india.oup.com/product/communication-skills-9780199488803	

Course Code: **BFS-S-108** **DSEC-1**	**DISCIPLINE SPECIFIC ELECTIVE COURSE** **GROUP - A** **FORENSIC SCIENCE SEMESTER-I** **INORGANIC & ORGANIC CHEMISTRY**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the basic knowledge of Chemistry (Inorganic and organic Chemistry).	
CO2.	Understanding the concept of Bohr atomic models and quantum mechanical model of atom.	
CO3.	Identifying various methods of preparations of hydrocarbons.	
CO4.	Describing the classification of organic compounds & concept of organic reaction mechanism and isomerism.	
CO5.	Describing advanced symmetry concepts of chemical molecules and its applications.	
Course Content:		
Unit-1:	**Atomic Structure:** Bohr's theory and its limitations, dual behavior of matter and radiation, de-Broglie's relation, Heisenberg Uncertainty principle. Shapes of s, p, d and f orbitals. Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations. **Fundamentals of Organic Chemistry:** Electronic Displacements: Inductive Effect, Electrometric Effect, Resonance and Hyper conjugation. Cleavage of Bonds: Homolysis and Heterolysis, Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals.	**9 Hours**
Unit-2:	**Quantum mechanics:** Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ2, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wave functions (atomic orbital's) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbital (Only graphical representation). Radial and angular nodes and their significance. **Quantum numbers:** Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms Shapes of s, p and d atomic orbital.	**9 Hours**
Unit-3:	**Chemical Bonding and Molecular Structure:** Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. **Covalent bonding:** VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral	**9 Hours**
Unit-4:	**Stereochemistry**:-Conformations with respect to ethane, butane and cyclohexane. Interco version of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Racemic mixture and resolution.	**9 Hours**
Unit-5:	**Aliphatic Hydrocarbons:** Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation. **Alkenes:** (Up to 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). **Alkynes:** (Up to 5 Carbons) Preparation: Acetylene from CuCu2 and conversion into higher alkynes by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides**.**	**12 Hours**
Textbook:	1. F. A. Cotton &G. Wilkinson: Basic Inorganic Chemistry, John Wiley.	
References:	1. Douglas, McDaniel and Alexander: Concepts and Models in Inorganic Chemistry, John Wiley. 2. James E. Huheey, Ellen Keiter and Richard Keiter: Inorganic Chemistry	

Course Code **BFS-S-109** **DSEC-1**	**DISCIPLINE SPECIFIC ELECTIVE** **COURSE GROUP B** **FORENSIC SCIENCE SEMESTER-I** **ELEMENTS OF MODERN PHYSICS**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the basic knowledge of Physics.	
CO2.	Understanding The central concepts of quantum mechanics: wave functions, momentum and energy operator, the Schrodinger equation, time dependent and time independent cases,	
CO3.	Understanding The properties of nuclei like density, size, binding energy, nuclear forces and structure of atomic nucleus, liquid drop model and nuclear shell model and mass formula.	
CO4.	Understanding the probability density and the normalization techniques, and applying the knowledge for skill development on Problem solving e.g. one-dimensional rigid box, tunneling through potential barrier, step potential, rectangular barrier.	
CO5.	Understanding the concepts of nuclear fission and fission and Radioactivity.	
Course Content:		
Unit-1:	**Light's nature**-:Planck's quantum, Planck's constant and light as a collection of photons; Photoelectric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment	**7 Hours**
Unit-2:	**Problems with Rutherford model:** instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra.	**7 Hours**
Unit-3:	**Atomic models and Quantum mechanics:** gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle, impossibility of a particle following a trajectory; Estimating minimum energy of a conned particle using uncertainty principle; Energy-time uncertainty principle. Two slit interference experiment with photons, atoms & particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of wave function, probabilities and normalization; Probability and probability current densities in one dimension.	**16 Hours**
Unit-4:	**Nuclear physics** -: Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy.	**7 Hours**
Unit-5:	**Radioactivity:** stability of nucleus; Law of radioactive decay; Mean life and half-life; decay; decay-energy released, spectrum and Pauli's prediction of neutrino; -ray emission. Fission and fusion-mass de cit, relativity and generation of energy; **Fission -** nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions.	**11 Hours**
Textbook:	1. Modern Physics, J.R. Taylor, C.D. Za ratos, M.A. Dubson,2009, PHI Learning	
References:	1. Quantum Physics, Berkeley Physics, Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill Co. 2. Modern Physics, R.A. Serway, C.J. Moses, and C.A.Moyer, 2005, Cengage Learning 3. https://books.google.co.in/books/about/Six_Ideas_That_Shaped_Physics_Unit_Q_Par.html?id =t- 9AAQAAIAAJ&redir_esc=y	

NOTE	Course Outcomes of following Practical's are covered in their respective theory courses.	
Course Code: **BFS-S-155** **SEC-1** **12HOURS**	**SKILL ENHANCEMENT COURSE** **FORENSIC SCIENCE SEMESTER-I** **FUNDAMENTALS OF FORENSIC SCIENCE –I (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	To perform mock homicide crime scene investigation.	
2.	To perform mock suicide crime scene investigation.	
3.	To perform mock hit and run crime scene investigation.	
4.	To perform mock hanging crime scene investigation.	
5.	Searching, Collection, packaging, preservation, handling, and forwarding of Physical evidences in Different crimes.	
6.	To perform mock court testimony of expert evidences in different types of crime.	

Course Code: **BFS-S-153** **SEC-2** **12HOURS**	**SKILL ENHANCEMENT COURSE** **FORENSIC SCIENCE SEMESTER-I** **BASICS OF BIOLOGY- I (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	Qualitative analysis of sugar, and proteins.	
2.	Study of different types of bone of human skeleton system.	
3.	Staining Techniques, Simple, Negative staining and Gram's Staining.	
4.	Study of aseptic techniques-preparation of cotton plugs for test tubes and pipettes, wrapping of Petri-plates and pipettes, transfer of media and inoculums.	
5.	Dissection and microscopic examination of flowers and leaf.	

Course Code: **BFS-S-156** **SEC-3** **12 HOURS**	**SKILL ENHANCEMENT COURSE** **FORENSIC SCIENCE SEMESTER-I** **FUNDAMENTALS OF COMPUTER SCIENCE (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	Finding results of different logic gates and their combinations.	
2.	Working with windows file (creation, modification, deletion, attributes) folder (creation, nesting, attributes). Working with Linux- file (Creation, modification, deletion, attributes), folder (creation, nesting attributes).	
3.	Understanding LAN-client/server, user creation, password protection. Use of internet- visiting websites with given URL, searching information using search engine. Use of E-mail, creating e-mail, sending and receiving e-mails with attachments.	
4.	Networking commands- like ping, IP configuration etc, with various switches. Tracing E-mail, finding senders IP address, of received email, tracing route of email received using tool available on internet, e.g. Visual Trace Route etc	

Course Code: **BFS-S-158** **DSEC-1** **12 HOURS**	**DISCIPLINE SPECIFIC ELECTIVE COURSE** **GROUP -A** **FORENSIC SCIENCE SEMESTER** **INORGANIC & ORGANIC CHEMISTRY** **(LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	**Inorganic Chemistry** 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Use of KMnO4 as redox titrimetric analysis. 3. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$. 4. Estimation of Fe (II) ions by titrating it with $K2Cr_2O_7$ using internal indicator 5. Estimation of Cu (II) ions eudiometrically usingNa_2S_2O3	
2.	**Organic Chemistry** 1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing up to two extra elements) 2. Separation of mixtures by Chromatography: Measure the Rf value in each case (Combination of two compounds to be given) a. Identify and separate the components of a given mixture of two amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography. b. Identify and separate the sugars present in the given mixture by paper Chromatography.	

Course Code: **BFS-S-159** **DSEC-1** **12 Hours**	**DISCIPLINE SPECIFIC ELECTIVE COURSE** **GROUP-B** **FORENSIC SCIENCE SEMESTER-I** **ELEMENTS OF MODERN PHYSICS (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	To determine value of Boltzmann constant using V-I characteristic of PN diode.	
2.	To determine work function of material of lament of directly heated vacuum diode.	
3.	To determine the ionization potential of mercury.	
4.	To determine value of Planck's constant using LEDs of at least 4 different colors.	
5.	To determine the wavelength of H-alpha emission line of Hydrogen atom.	
6.	To determine the absorption lines in the rotational spectrum of Iodine vapor.	
7.	To study the reaction patterns of single and double slits using laser and measure its intensity variation using Photosensor & compare with incoherent source Na.	
8.	Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo- electrons versus frequency of light.	
9.	To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.	

Course Code: **BFS-S-205** **CC-4**	**CORE COURSE** **FORENSIC SCIENCE SEMESTER-II** **FUNDAMENTALS OF FORENSIC SCIENCE -II**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Knowing the fundamentals of law and its importance in any Criminal justice system.	
CO2.	Understanding the concepts of Civil and Criminal law and its relevance to Forensic Science.	
CO3.	Describing the concepts of some sections of IEA, IPC, and CrPC related with Forensic Science.	
CO4.	Identifying the structural and functional levels of various Crime Investigation agencies at National and International level.	
CO5.	Understanding the concept of Dowry Prohibition Act, Immoral Traffic Prevention Act, Wildlife Protection Act., and Environment Protection Act.	
Course Content:		
Unit-1:	Definition of Law, Court, Judge, FIR, Difference between civil and Criminal Justice, Objectives of Punishment	**9 Hours**
Unit-2:	**Law to Combat Crime**-Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts**.** **Criminal Procedure Code**. Cognizable and non-cognizable offences. Bailable and non-bailable offences. Sentences which the court of Chief Judicial Magistrate may pass.	**9 Hours**
Unit-3:	**Laws specific to Forensic Science: Indian Penal Code:** Sections pertaining to offences against persons – Sections 121A, 299, 300, 302, 304A, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362. Sections 375 & 377 and their amendments. **Indian Evidence Act** – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses. Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141. **CrPC –** Sections 291,291A, 292 & 293 in the code of criminal procedure.	**9 Hours**
Unit-4:	**Police Science:** Definition and scope of Police organization under central government, state and district level; General information about their structure and function BPR&D, CBI, IB, RAW, NCRB, NICFS, INTERPOLE- history, structure, general and special notices.	**9 Hours**
Unit-5:	**Acts Pertaining to Socio-economic and Environmental Crimes.** 1. Dowry Prohibition Act. 2. Immoral Traffic Prevention Act. 3. Wildlife Protection Act. 4. Environment Protection Act.	**12 Hours**
Textbook:	1. Vipa P. Sarthi, Law of Evidence, 6th Edition, Eastern Book Co., Lucknow (2006).	
References:	1. A.S. Pillia, Criminal Law, 6th Edition, N.M. Tripathi Pvt Ltd., Mumbai (1983). 2. R.C. Nigam, Law of Crimes in India, Volume I, Asia Publishing House, New Delhi (1965).	

Course Code: **BFS-S-203** **CC-5**	**CORE COURSE** **FORENSIC SCIENCE SEMESTER-II** **BASICS OF BIOLOGY –II**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Recalling the fundamental concept of physiological systems of human body and understanding their importance in crime investigations.	
CO2.	Understanding the concepts of immunology and their role in identification of an individual	
CO3.	Understanding the fundamental concept of Tissue system and their importance in crime scene investigations.	
CO4.	Applying the knowledge of the biochemical structure and function of DNA for individualization of human being.	
CO5.	Applying the principle and mechanics of various microscopes for using them to in visualize trace evidence and comparing it with control samples.	
Course Content:		
Unit-1:	**Immunity**: Definition, types-natural, acquired, active, passive. Antigens-Definition, types of antigens; Factors influencing antigenicity; Antibody-Definition, structure, types, properties and functions of Immunoglobulin, Antigen and Antibody Reaction-Agglutination, Precipitation.	**5 Hours**
Unit-2:	**Basic concepts of genetics:** Genetic material– Discovery, experiments, composition and structure of DNA and RNA, organization of DNA in chromosomes, genetic code, Mendelian principles, Introduction to recombinant DNA technology, its applications in health, agriculture, industries & forensics	**10 Hours**
Unit-3:	**Human physiology:** Introduction to Nervous system, respiratory system, digestive system, circulatory system, endocrine system.	**20 Hours**
Unit-4:	**The Skeletal System:** Functions of the Skeleton, Types of Bone Tissue, Factors affecting bone growth and maintenance, The Skeleton, types of joints and movement	**4 Hours**
Unit-5:	**Microscopy-** Principle, working, mechanism, construction, ray Diagram, Forensic applications of compound Microscope, Comparison Microscope, Fluorescence Microscope, Polarizing Microscope.	**5 Hours**
Textbooks:-	1. Text book of Microbiology, Ananth Naryan Pannikar. 2. Principle of Biochemistry by Lehninger.	
References:	1. Human Physiology : From Cells to Systems, II Lauralee Sherwood, Cengage Learning,2008 2. https://www.pdfdrive.com/biochemistry-genetics-molecular-biology-e18198970.htmlAlberts, B. et al. Essential Cell Biology, Garland, 3rd edn 2009	

Course Code: **BFS-S-206** **CC-6**	**CORE COURSE** **FORENSIC SCIENCE SEMESTER-II** **BASICS OF DIGITAL & CYBER FORENSIC**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1	Understanding the concept of digital forensics advance technology and its relevance in solving the cases related with cyber security issues.	
CO2	Identifying the concept of Human Biometric system based on human biological distinct characteristics and applying the knowledge to solve the identity theft related cases.	
CO3	Summarizing the different phases of incident response and its importance in maintaining network security.	
CO4	Explaining the concept of cyber security tools and their relevance related with different forensic digital crimes.	
CO5	Applying the concept of digital crime scene evidence collection and data retrieval methods for different cyber security crimes.	
Course Content:		
Unit-1	**Introduction to Computer/Cyber Forensic, Investigation process.** The Goal of the Forensic Investigation, Why Investigate (Internet usage exceeds norm, Using e-mail inappropriately, Use of Internet, e-mail, or PC in a non-work-related manner, Theft of information, Violation of security policies or procedures, Intellectual property infractions, Electronic tampering), Establishing a Basis or Justification to Investigate, Auditing V/s Cyber Forensic Investigations**.**	**9 Hours**
Unit-2	**Introduction to Biometrics,** What is Biometrics, Use of Biometrics, Model of Biometric system Various types of Biometric methods, User Acceptance, Evaluating Accuracy, Advantages & disadvantages of biometrics.	**9 Hours**
Unit-3	**Incident Response –** Introduction , Computer Security Incident, goals of Incident Response, Who is involved in Incident Response Process, Incident Response Methodology, Formulate a Response Strategy, Investigate the Incident, Preparing For Incident Response, Overview of Pre-incident Preparation, Identifying Risk, Post Detection of an Incident.	**9 Hours**
Unit-4	**Cyber Forensic Tools and Utilities-**Introduction, Examining Breadth of Products, Cyber Forensic Tools. What's the Right Incident Response Tool for Your Organization? Tool Review Forensic Toolkit, EnCase, Cyber check suites etc., Disk Imaging	**9 Hours**
Unit-5	**Evidence Collection and Analysis Tools-**Volatile and Non volatile Evidences collection (Safeback, Gettime, FileList, Filecvt and Excel, Getfree, Swapfiles and Getswap, GetSlack, Temporary Files), Detailed Procedures for Obtaining a bit stream backup of hard drive, File System, Data Structure Of File System, Data Recovery in Different file system.	**12 Hours**
Textbook:	**1.** Cyber Forensic A Field Manual for Collecting, Examining and Preserving Evidence of Computer Crimes by Albert J Menendez. Auerbach Publications	
References:	1. Digital Forensics: Digital Evidence in Criminal Investigations by Angus McKenzie Marshal 2. https://www.springer.com/gp/book/9780387773254	

Course Code: **BFS-S-208** **DSEC-2**	**DISCIPLINE SPECIFIC ELECTIVE COURSE** **GROUP -A** **FORENSIC SCIENCE SEMESTER-II** **PHYSICAL & ORGANIC CHEMISTRY-I**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the fundamental concept of Chemistry (Physical and organic Chemistry).	
CO2.	Understanding the laws of Thermodynamics.	
CO3.	Understanding the basic concept of Thermo chemistry.	
CO4.	Summarizing the different methods of preparation of aromatic hydrocarbon and aryl halides	
CO5.	Explaining the ionization of electrolytes and salt hydrolysis.	
Course Content:		
Unit-1:	**Laws of Thermodynamics:** Introduction of thermodynamics; Statement of First, second Third Law of thermodynamics and calculation of absolute entropies of substances.	**9 Hours**
Unit-2:	**Chemical Energetic:** Important principles and definitions of thermo chemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermo chemical data.	**9 Hours**
Unit-3:	**Ionic Equilibrium:** Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis- calculation of hydrolysis constant, degree of hydrolysis and pH for different salts.	**9 Hours**
Unit-4:	**Aromatic hydrocarbons Preparation (Case benzene):** from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions: (Case benzene): Electrophilic substitution: nitration, halogenations and sulphonation.	**9 Hours**
Unit-5:	**Aryl Halides:** Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by – OH group) and effect of nitro substituent. Alcohols: Preparation: Preparation of primary, secondary and tertiary alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.	**12 Hours**
Textbook:	1. F. A. Cotton &G. Wilkinson: Basic Inorganic Chemistry, John Wiley.	
References:	1. Douglas, McDaniel and Alexader: Concepts and Models in Inorganic Chemistry, John Wiley. 2. Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman. 3. https://books.google.co.in/books/about/Organic_Chemistry.html?id=E4VylgguUR8C	

Course Code: **BFS-S-209** **DSEC-2**	**DISCIPLINE SPECIFIC ELECTIVE COURSE** **GROUP -B** **FORENSIC SCIENCE SEMESTER-II** **MECHANICS**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Recognising the concept of simple harmonic motion and damped oscillator.	
CO2.	Recalling the frame of references and understanding fundamentals of special relativity.	
CO3.	Understanding the concept of relativity and implementing the knowledge for context of time dilation, length contraction, and relativistic addition of velocities.	
CO4.	Explaining the concept of Dynamics of rigid bodies and Moment of inertia.	
CO5.	Applying the concept of gravitation	
Course Content:		
Unit-1:	**Laws of Motion:** Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. **Momentum and Energy:** Conservation of momentum. Work and energy, Conservation of energy.	**9 Hours**
Unit-2:	**Rotational Motion:** Angular velocity and angular momentum. Torque. Conservation of angular Momentum. **Gravitation:** Newton's Law of Gravitation. Motion of a particle in a central force Field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only).	**9 Hours**
Unit-3:	**Oscillations:** Simple harmonic motion. Di erential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations	**9 Hours**
Unit-4:	**Special Theory of Relativity: C**onstancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.	**9 Hours**
Unit-5:	**Elasticity:** Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants Poissons Ratio-Expression for Poissons ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q, and by Searles method.	**12 Hours**
Textbook:	**1.** Mechanics, D.S. Mathur, S. Chand and Company Limited.	
References:	1. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, McGraw-Hill. 2. Mechanics, Berkeley Physics, vol.1, C. Kittel, W. Knight, et.al. Tata McGraw-Hill. Physics, Resnick, Halliday and Walker,Wiley. 3. Analytical Mechanics, G.R. Fowles and G.L. Cassiday. Cengage Learning. 4. https://www.feynmanlectures.caltech.edu/I_toc.html	

Course Code: **TMUGE201** **AECC-2**	**ABILITY ENHANCEMENT COMPIULSORY COURSE** **FORENSIC SCIENCE SEMESTER-II** **ENGLISH COMMUNICATION-II**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	**40 hours**
CO1.	**Remembering & understanding** the basics of English Grammar and Vocabulary	
CO2.	**Understanding** the basics of Listening, Speaking & Writing Skills	
CO3.	**Understanding** principles of letter drafting and various types of formats.	
CO4.	**Applying** correct vocabulary and grammar in sentence construction while writing and delivering presentations	
CO5.	**Analyzing** different types of listening, role of Audience & Locale in presentation	
CO6.	**Creating** Official Letters, E-Mail & Paragraphs in correct format.	
Course Content:		
Unit-1:	**Functional Grammar-** a. Prefix, suffix and One words substitution b. Modals c. Concord	**10 Hours**
Unit-2:	**Listening Skills-** a. Difference between listening & hearing, Process and Types of Listening b. Importance and Barriers to listening	**4 Hours**
Unit-3:	**Writing Skills-** a. Official letter and email writing b. Essentials of a paragraph, c. Developing a paragraph: Structure and methods d. Paragraph writing (100-120 words)	**12 Hours**
Unit-4:	**Strategies & Structure of Oral Presentation** a. Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body language b. Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch. c. Modes of speech delivery and 5 W's of presentation	**8 Hours**
Unit-5:	**Value based text reading: Short Essay (Non- detailed study)** How should one Read a book? – Virginia Woolf	**6 Hours**
Textbook:	1. Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	
References:	1. Nesfield J.C. "English Grammar Composition & Usage" Macmillan Publishers 2. Sood Madan "The Business letters" Goodwill Publishing House, New Delhi 3. https://india.oup.com/product/communication-skills-9780199488803	

NOTE	Course Outcomes of following Practical's are covered in their respective theory courses.	
Course Code: **BFS-S-255** **SEC-4** **12 HOURS**	**SKILL ENHANCEMENT COURSE** **FORENSIC SCIENCE SEMESTER-II** **FUNDAMENTALS OF FORENSIC SCIENCE -II (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	To prepare a schedule of five cognizable and five non cognizable offences.	
2.	To study the powers and limitations of the Court of Judicial Magistrate of First Class.	
3.	To prepare a schedule of the offences which may be tried under Section 260(2) of CRPC	
4.	To study a crime case in which an accused was punished on charge of murder under Section 302.	
5.	To study a crime case in which an accused was punished on charge of rape under Section 375.	
6.	To cite example of a case in which opinion of an expert was called for under section 45 of the Indian Evidence Act.	

Course Code: **BFS-S-253** **SEC-5** **12 HOURS**	**SKILL ENHANCEMENT COURSE** **FORENSIC SCIENCE SEMESTER-II** **BASICS OF BIOLOGY -II (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	Study of principle and working of compound microscope	
2.	Study of instruments: Microscope, Autoclave, Hot air oven, incubator, pH meter, centrifuge and Laminar air flow.	
3.	Study of Beer-Lambert's law using colorimeter along with its principle and working.	
4.	Study of skeletal system.	
5.	Study of different types of bones.	

Course Code: **BFS-S-256** **SEC-6** **12 HOURS**	**SKILL ENHANCEMENT COURSE** **FORENSIC SCIENCE SEMESTER-II** **BASICS OF DIGITAL & CYBER FORENSIC (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	Identification, Seizure, Search of Digital media.	
2.	Evidence collection & Demonstration of various Forensic tools like Partition magic, Encase etc.	
3.	Data Recovery, Deleted File Recovery viewing small Disk. Viewing small disk MBR.	
4.	Demonstration of Concealment Techniques (Stenography).	
5.	Demonstration of other Concealment Techniques.	
6.	Formatting NTFS and EX2, EX3.	
7.	Case study of Biometric Techniques.	

Course Code: **BFS-S-258** **DSEC-2** **12 HOURS**	**DISCIPLINE SPECIFIC ELECTIVE COURSE** **GROUP-A** **FORENSIC SCIENCE SEMESTER-II** **PHYSICAL & ORGANIC CHEMISTRY- I (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	**Physical Chemistry** 1. Determination of heat capacity of calorimeter for different volumes. 2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide. Determination of enthalpy of ionization of acetic acid. 3. Determination of integral enthalpy of solution of salts (KNO3, NH4Cl). Determination of enthalpy of hydration of copper sulphate. 4. Study of the solubility of benzoic acid in water and determination of ΔH pH measurements 5. Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter. **Preparation of buffer solutions:** (i)Sodium acetate-acetic acid (ii)Ammonium chloride ammonium hydroxide(iii)Measurement of the pH of buffer solutions and comparison of the values with Theoretical values.	
2.	**Organic Chemistry** Purification of organic compounds by crystallization (from water and alcohol) and distillation. Criteria of Purity: Determination of melting and boiling points. **Preparations:** Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done. (a) Bromination of Phenol/Aniline. (b) Benzoylation of amines/phenols. (c) Oxime and 2,4dinitrophenylhydrazone of aldehyde/ketone.	

Course Code: **BFS-S-259** **DSEC-2** **12 HOURS**	**DISCIPLINE SPECIFIC ELECTIVE COURSE** **GROUP-B** **FORENSIC SCIENCE SEMESTER-II** **MECHANICS (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	Measurements of length (or diameter) using vernier caliper, screw gauge and travelling micro-scope.	
2.	To determine the Height of a Building using a Sextant.	
3.	To determine the Moment of Inertia of a Flywheel.	
4.	To determine the Young's Modulus of a Wire by Optical Lever Method.	
5.	To determine the Modulus of Rigidity of a Wire by Maxwells needle.	
6.	To determine the Elastic Constants of a Wire by Searles method.	
7	To determine 'g' by Bar Pendulum& Katers Pendulum.	

8	To study the Motion of a Spring and calculate (a) Spring Constant (b) g.	

Course Code: **BFS-S-303** **CC-7**	**CORE COURSE** **FORENSIC SCIENCE SEMESTER-III** **FORENSIC BIOLOGY - I**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the composition of biological fluids – blood, urine, semen, saliva, sweat and milk and Applying for chemical and serological examination of samples.	
CO2.	Interpreting concepts of blood pattern and applying the knowledge of pattern analysis in solving Crime scene.	
CO3.	Understanding the hair and fiber morphology and analyzing that how this knowledge assists in death Investigations.	
CO4.	Applying the art of collecting, packaging and preserving different types of biological evidences and Applying this during the reconstruction of crime scene practical.	
CO5.	Analyzing the biological evidences such as blood , urine etc encountered in various crime scene	
Course Content:		
Unit-1:	**Forensic Biology**-- Introduction, Evidences of Biological Importance, Nature, scope of crime scene presence and characterization (blood, semen, vaginal fluids, saliva, urine, sweat, skin, nails, tissue, tooth, bones, uterine fluid, vomit, vitreous humor, CSF, colostrums).	**9 Hours**
Unit-2:	**Crime Scene Investigation-** Recognition of Biological evidences encountered in various cases, Search, Collection, protection, documentation and chain of custody of Biological Evidences, Packaging & transportation of Biological Evidences.	**9 Hours**
Unit-3:	**Hair:** Collection, biochemistry and forensic examination (origin, nature, source, sex determination and DNA profiling). **Fiber: -** Types of fiber, natural (plant animal and mineral), synthetic (nylon, polyester, terylene, Carbon-nano tube fiber), and blended (terrycloth, rayon).	**9 Hours**
Unit-4:	**Body fluids**-Definition, Types of Body Fluids, (Blood, Semen, Saliva, Sweat, Urine) their properties, Significance, collection, preservation, preliminary and confirmatory tests.	**9 Hours**
Unit-5:	**Bloodstain Pattern Analysis**--Bloodstain characteristics. Different types of bloodstain Patterns. Blood trails. Bloodstain drying times. Documentation of bloodstain pattern evidence. Crime scene reconstruction with the aid of bloodstain pattern analysis.	**12 Hours**
Textbook:	1. Scientific & Legal Applications of Bloodstain Pattern Interpretation – Stuart H. James	
References :	1. Forensic Biology by Richard li. 2. Practical Skills in Forensic Science – Alan Langford, John Dean et.al 3. Forensic biology by Max M.Houck (E-book). 4. Essential of forensic biology by Alan Gunn(E-book).	

Course Code: **BFS-S-305** **DSC-1**	**DISCIPLINE SPECIFIC COURSE** **FORENSIC SCIENCE SEMESTER-III** **FORENSIC MEDICINE**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the concept of Forensic Medicine & concept of inquest, oath and various court proceedings used in medico legal investigation.	
CO2.	Interpreting the concept of bimolecular changes after death and it's the Medico legal significance	
CO3.	Explaining the wounds and injuries their nature, classification and laws and differentiate the homicide, suicidal and accidental injuries.	
CO4.	Applying the Forensic anthropological & forensic odontological techniques to determine age, sex and race from skeletal remains.	
CO5.	Analyzing the different asphyxia death scenarios like hanging, strangulation and drowning through case study.	
Course Content:		
Unit-1:	**Forensic Anthropology -** Nature, formation, and identification of human bones and their scope in forensic anthropology. Determination of age, sex, race from skeletal material. Facial reconstruction and its forensic significance.	**9 Hours**
Unit-2:	**Procedure in court**: Inquest and its type. Oath, Examination–in–chief, Cross Examination and Re-Examination; Medico legal Reports and Dying declaration.	**9 Hours**
Unit-3:	**Forensic Odontology**-Development, Types of teeth and their comparative anatomy. Estimation of Age from teeth, and role of forensic odontology in mass disaster and other crime scene. **Bite marks**-Introduction, Collection, preservation and photography of bite marks evidence. Forensic significance of bite marks and its Legal aspects.	**12 Hours**
Unit-4:	**Thanatology-** Definition, Types of death (somatic and molecular).Medico-legal aspects and estimation of time of death in terms of Changes after death (immediate, early and late changes), Ashphysxial Deaths (strangulation, hanging, drowning etc).	**9 Hours**
Unit-5:	**Wounds and Injuries-** Definition of wounds and injuries and laws governing them. Types and classification of injuries. Ante mortem and post mortem injuries. Aging of injuries. Artificial injuries. Difference between suicidal, homicidal and accidental injuries.	**9 Hours**
Textbook:	1. Reddy,V.R; Dental Anthropology, Inter-India Publication, New Delhi,1985.	
References:	1. Kroeber; Anthropology, Oxford & IBH Publishing Company, New Delhi, 1972. 2. Pickering, R. & Bachman D; The use of Forensic Anthropology, CRC Press, Costa Rica, 2009. 3. Simpson's Forensic Medicine by Richard Shepherd(E-book) 4. Forensic Anthropology and Medicine: Complementary Sciences From Recovery to Cause of Death by Aurore Schmitt, Eugénia Cunha, João Pinheiro (E-book)	

Course Code: **BFS-S-310** **DSC-2**	**DISCIPLINE SPECIFIC COURSE** **FORENSIC SCIENCE SEMESTER - III** **ADVANCED DIGITAL & CYBER FORENSIC**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the significance of cyber forensic investigation process and when to conduct it.	
CO2.	Understanding the various technical issues related with cyber forensic investigations	
CO3.	Explaining the Design and implementation of security policies using software and hardware tools.	
CO4.	Applying the tools, technique and algorithms of cryptography and its applications in cyber security.	
CO5.	Analysing the concept of cyber security and its potential network threats.	
Course Content:		
Unit-1:	**Cyber Forensics Investigation**—Introduction to Cyber Forensic Investigation, Investigation Tools, e Discovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking.	**9 Hours**
Unit-2:	**Technical issues –** Security Technologies: Certification and key Distribution, Digital Signature Protocols for Transactions, SSL Secure Socket Layer, SET-Secure Electronic Transaction	**9 Hours**
Unit-3:	**Security Issues** –Types of Attacks (Active and Passive) Stealing Passwords, Social Engineering, Bugs and Backdoors, Illegal accessing, Authentication Failures, Protocol Failures, Information Leakage, Viruses and Worms, Denial-of- Service, etc. – Firewalls, Packet Filters, Application-Level Filtering, Circuit- Level Gateways, Dynamic Packet Filters, Distributed Firewalls; Digging for Worms, Packet Filtering, implementing policies (Default allow, Default Deny) on proxy, etc.	**9 Hours**
Unit-4:	**Introduction to Cyber Security**, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Threats, crimes, etc.; why require a security? Picking a Security Policy, Strategies for a Secure Network, The Ethics of Computer Security, Security Threats, and levels, Security Plan (RFC 2196)	**9 Hours**
Unit-5:	**Cryptographic Techniques** Introduction to Cryptography, Types of Cryptographic Algorithms (Secret Key Cryptography, Public Key Cryptography, Hash Function), Electronic Signature, Stenography, Reversing the Stenographic Process, Manipulating File System, Data Hiding on NTFS with Alternate data Streams	**12 Hours**
Textbook:	1. Firewalls and Internet Security: Repelling the Wily Hacker, Second Edition Addison	
References:	1. File System Forensic Analysis by Brian Carrier, Publisher: Addison-Wesley Professional 2. Cyber Law & Crimes (IT Act 2000 & Computer Crime Analysis) by Barkha & Ram Mohan, Publisher: Asian Law House, Hyderabad 3. Digital Forensics and Incident Response: A practical guide to deploying digital forensic techniques in response to cyber security incidents by Gerard Johansen (E-book) 4. Practical Cyber Forensics. An Incident-based Approach to Forensic Investigations by Niranjan Reddy(E-book)	

Course Code: **TMUGE301** **AECC-3**	**ABILITY ENHANCEMENT COMPULSORY COURSE** **FORENSIC SCIENCE SEMESTER-III** **ENGLISH COMMUNICATION-III**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	**24 Hours**
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the art of public speaking and strategies of reading comprehension.	
CO3.	Applying correct vocabulary and sentence construction during public speaking or professional writing.	
CO4.	Analyzing different types of sentences like simple, compound and complex. Drafting notice, agenda and minutes of the meeting.	
CO5.	Developing speaking skills during common conversation and power point presentation.	
Course Content:		
Unit-1:	**English Grammar & Vocabulary** • Correction of Common Errors (with recap of English Grammar with its usage in practical context.) • Synthesis : Simple , complex and compound sentence Commonly used Idioms & phrases (Progressive learning whole semester)	**06 Hours**
Unit-2:	**Speaking Skills** • Art of public speaking • Common conversation • Extempore • Power Point Presentation (Pptx) Skills**:** Nuances of presenting PPTs	**08 Hours**
Unit-3:	**Comprehension Skills** • Strategies of Reading comprehension: Four's • How to solve a Comprehension (Short unseen passage: 150-200 words)	**03 Hours**
Unit-4:	**Professional Writing** 1. Preparing Notice, Agenda & Minutes of the Meeting	**04 Hours**
Unit-5:	**Value based text reading:** Short story. • The Barber's Trade Union – Mulk Raj Anand	**03 Hours**
Textbook:	1. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
References:	**1.** Allen, W. "Living English Structure" Pearson Education, New Delhi. **2.** Joseph, Dr C.J. & Myall E.G. "A Comprehensive Grammar of Current English" Inter University Press, Delhi **3.** Kumar Sanjay & Pushplata"Communication Skills"Oxford University Press, New Delhi.	

Course Code: **BFS-S-306** **AECC-4**	**ABILITY ENHANCEMENT COMPULSORY COURSE** **FORENSIC SCIENCE SEMESTER-III** **ENVIRONMENTAL SCIENCE**	**L-4** **T-0** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding basic concepts in the context of ecological and environmental sciences.	
CO2.	Interpreting the ideas about energy resources in today's scenario and discussing about alternate energy sources.	
CO3.	Classifying and describe biodiversity and also summarize biogeographically distribution of India.	
CO4.	Describing concepts and methods to apply in environmental communication and public awareness.	
CO5.	Interpreting the ethical and cultural conduct in environmental activities.	
Course Content:		
Unit-1:	Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.	**10 Hours**
Unit-2:	**Ecology and Environment**: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid& Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.	**8 Hours**
Unit-3:	**Natural Resources:** Renewable & Non-Renewable resources; Land resources and land use change; Land degradation, Soil erosion & desertification. **Deforestation**: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources**: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies. **Biodiversity:** Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, bio geographical Classification of India	**12 Hours**
Unit-4:	**Environmental policies & practices: Climate change & Global** Warming (Green house Effect),Ozone Layer -Its Depletion and Control Measures, Photochemical Smog, Acid Rain Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context.	**10 Hours**
Unit-5:	**Human Communities & Environment:** Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Bishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case studies.	**08 Hours**
Text Books:	**1.** "Environmental Chemistry", De, A. K., New Age Publishers Pvt.Ltd.	
References:	**1.** "Biodiversity and Conservation", Bryant, P. J., Hypertext Book **2.** "Textbook of Environment Studies", Tewari, Khulbe & Tewari ,I.K. Publication **3.** Fundamentals of Ecology", Odem, E. P., W. B. Sannders Co. **4.** "Introduction to Environmental Engineeringand Science", Masters, G. M., Prentice Hall India Pvt.Ltd.	

Course Code: BFS-S-308 DSCE-3	**DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-III** **ANALYTICAL CHEMISTRY**	**L-4 T-0 P-2 C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Describing the basic concept of analytical chemistry. Qualitative and quantitative analysis.	
CO2.	Understanding the theoretical principles of various separation techniques in chromatography, and Explaining the applications of chromatographic techniques.	
CO3.	Applying the basic statistical treatment of the analytical data for getting a correct result.	
CO4.	Analyzing the chemical structure of water and soil.	
CO5.	Analyzing the chemical composition of cosmetics and their functions in different products.	
Course Content:		
Unit-1:	**Qualitative and quantitative aspects of analysis:** Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression. Normal law of distribution of indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.	**9 Hours**
Unit-2:	**Analysis of soil:** Composition of soil, Concept of pH and pH measurement, Complex metric titrations, Chelation, Chelating agents, Determination of pH of soil samples.	**9 Hours**
Unit-3:	**Analysis of water:** Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods. Determination of pH, acidity and alkalinity of a water sample. Determination of dissolved oxygen (DO) of a water sample.	**9 Hours**
Unit-4:	**Chromatography:** Definition general introduction on principles of chromatography, paper chromatography TLC etc. 1. Paper chromatographic separation of mixture of metal ion (Fe^{3+} andAl^{3+}). 2. To compare paint samples by TLC method. Ion-exchange: Column, ion-exchange chromatography etc.	**9 Hours**
Unit-5:	**Analysis of cosmetics**: Major and minor constituents and their function. 1. Analysis of deodorants and anti perspirants, Al, Zn, boric acid, chloride, sulphate. 2. Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc	**12 Hours**
Textbook:	1. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman.	
References:	1. Willard, H. H. Instrumental Methods of Analysis, CBS Publishers. 2. Skoog & Lerry. Instrumental Methods of Analysis, Saunders College Publications, New York. 3. Modern analytical chemistry by David T Harvey(E-book) 4. Handbook Of Instrumental Techniques For Analytical Chemistry by Frank A. Settle (E-book)	

Course Code: **BFS-S-309** **DSEC-3**	**DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP-B** **FORENSIC SCIENCE SEMESTER-III** **ELECTRICITY & MAGNETISM**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the relation between electric field and potential, exploiting the potential to solve a variety of problems, and relating it to the potential energy of a charge distribution.	
CO2.	Describing electric dipoles and the role of molecular dipoles in the electrostatic response of dielectrics. Demonstrating a working understanding of capacitors.	
CO3.	Identifying the Calculation of the magnetic forces that act on moving charges and the magnetic fields due to currents (Biot- Savart and Ampere laws)	
CO4.	Applying the Gauss's law of electrostatics to solve a variety of problems.	
CO5.	Applying the concepts of induction and self-induction, to solve problems using Faraday's and Lenz's laws	
Course Content:		
Unit-1:	**Electric Field and Electric Potential** Electric field lines, Electric flux, Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. **Electrostatic Potential.** Laplace's and Poisson equations (Only statement). Potential and Electric Field of a dipole. Force and Torque on a dipole.	**9 Hours**
Unit-2:	**Electrostatics**: Electrostatic energy of system of charges. Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor.	**9 Hours**
Unit-3:	**Dielectric Properties of Matter:** Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector **D**. Relations between **E**, **P** and **D**. Gauss' Law in dielectrics.	**9 Hours**
Unit-4:	**Magnetic Field:** Magnetic force between current elements and definition of Magnetic Field **B**. Biot- Savart's Law and its simple applications: straight wire and circular loop. Ampere's Circuital Law. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements.	**9 Hours**
Unit-5:	**Magnetic Properties of Matter:** Magnetization vector (**M).** Magnetic Intensity (**H).** Magnetic Susceptibility and permeability. Relation between **B, H, M**. Ferromagnetism. B-H curve and hysteresis **Electromagnetic Induction:** Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Energy stored in a Magnetic Field.	**12 Hours**
Textbook:	1. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Ed., Kitab Mahal	
References:	1. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, , Heinemann Education Publishers 2. Engineering Practical Physics, S. Panigrahi and B. Mallick, Cengage Lea 3. A Treatise on Electricity and Magnetism by James Clerk Maxwell(E-book) 4. Electricity and magnetism by Nayfeh M.H., Brussel M.K(E-book)	

NOTE	Course Outcomes of following Practical's are covered in their respective theory courses.	
Course Code: **BFS-S-353** **SEC-7** **12 HOURS**	**SKILL ENHANCEMENT COURSE** **FORENSIC SCIENCE SEMESTER-III** **FORENSIC BIOLOGY – I (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	Microscopic Comparison of Hair Animal Hair & Human Hair.	
2.	Microscopic Comparison of natural and synthetic Fibers.	
3.	Presumptive and Confirmatory Tests for Blood.	
4.	ABO Grouping & Rhesus Factor.	
5.	Microscopic examination of spermatozoa.	
6.	Identification of saliva stain.	

Course Code: **BFS-S-355** **SEC-8** **12 HOURS**	**SKILL ENHANCEMENT COURSE** **FORENSIC SCIENCE SEMESTER-III** **FORENSIC MEDICINE (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	To design a questionnaire for the first responder to the death scene.	
2.	To design a protocol to deal with the media at the crime scene.	
3.	To design a checklist for the forensic scientists at the death scene.	
4.	To design a canvass form giving description of an unidentified victim.	
5.	To analyze and preserve bite marks.	
6.	To study different stages of changes after death.	
7.	To identify shooter on the basis of firearm injuries.	
8.	To identify different causes of death.	
9.	To study post-mortem findings of a cadaver.	

Course Code: **BFS-S-356** **SEC-9** **12 HOURS**	**SKILL ENHANCEMENT COURSE** **FORENSIC SCIENCE SEMESTER-III** **ADVANCED DIGITAL & CYBER FORENSIC (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	Identification, Seizure, Search of Digital media.	
2.	Evidence Collection.	
3.	Demonstration of various Forensic tools like Partition magic, Encase etc.	
4.	Data Recovery, Deleted File Recovery viewing small Disk.	
5.	Demonstration of Concealment Techniques (Cryptography PGP).	
6.	Demonstration of Concealment Techniques (Stenography).	
7.	Demonstration of other Concealment Techniques.	
8.	Case study of Biometric Technique.	

Course Code: **BFS-S-358** **DSEC-3** **12 HOURS**	**DISCIPLINE SPECIFIC ELECTIVE** **COURSE GROUP-A** **FORENSIC SCIENCE SEMESTER-III** **ANALYTICAL CHEMISTRY (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	**Separation Techniques**: Chromatography 1. Separation of mixtures--Paper chromatographic separation of Fe^{3+} and Al^{3+}. 2. Separation and identification of the monosaccharide present in the given mixture (glucose & fructose) by paper chromatography. 3. Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify them on the basis of their Rf values.	
2.	**Solvent Extractions:** 1. Determine the pH of the given aerated drinks fruit juices, shampoos and soaps. 2. Determination of Na, Ca, Li in cola drinks and fruit juices using flame photometric techniques. 3. Analysis of soil: i. Determination of pH of soil. ii. Total soluble salt iii. Estimation of calcium, magnesium, phosphate, nitrate	

Course Code: **BFS-S-359** **DSEC-3** **12 HOURS**	**DISCIPLINE SPECIFIC ELECTIVE COURSE** **GROUP-B** **FORENSIC SCIENCE SEMESTER-III** **ELECTRICITY & MAGNETISM (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.	
2.	To study the characteristics of a series RC Circuit.	
3.	To determine an unknown Low Resistance using Potentiometer.	
4.	To determine an unknown Low Resistance using Carey Foster's Bridge.	
5.	To compare capacitances using De'Sauty's bridge.	
6.	Measurement of field strength B and its variation in a solenoid (determine dB/dx).	
7.	To determine self-inductance of a coil by Anderson's bridge.	
8.	To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, & Impedance at resonance,	
9.	To study response curve of a Series LCR circuit and determine its (a) Quality factor Q, & (b) Band width.	
10.	To study the response curve of a parallel LCR circuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q.	
11.	Determine a high resistance by leakage method using Ballistic Galvanometer.	
12.	To determine self-inductance of a coil by Rayleigh's method.	

Course Code: TMUGS-301 VAC I	VALUE ADDED COURSE -I FORENSIC SCIENCE SEMESTER-III MANAGING SELF	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	**TOTAL 30 HOURS**
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analyzing self and devising a strategy for self growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	**Personal Development:** Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	**10 Hours**
Unit-2:	**Professional Development:** Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	**8 Hours**
Unit-3:	**Career Development:** Resume Building Occupational Research Group discussion (GD) and Personal Interviews	**12 Hours**
References:	1. Robbins, Stephen P.,Judge, Timothy A. Vohra, Neharika, Organizational Behavior (2018), 18th ed., Pearson Education 2. Tracy, Brian, Time Management (2018), Manjul Publishing House 3. Hill, Napolean, Think and grow rich (2014), Amazing Reads 4. Scott, S.J., SMART goals made simple (2014), Create space Independent Pub 5. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017),Macmillan 6. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression.	

Course Code: **BFS-S-403** **CC-8**	**CORE COURSE** **FORENSIC SCIENCE SEMESTER-IV** **FORENSIC BIOLOGY - II**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the morphology of arthropods and apply its use in estimating time since death under forensic Entomology.	
CO2.	Explaining the concept of wild life forensic, and evidences like pug marks , ivory and their significance in conserving natural resources	
CO3.	Examining the importance of various microorganisms responsible for cases like food poisoning and bioterrorism.	
CO4.	Identifying bird's flight mechanism and feather topography to avoid bird accidents and their illegal trading.	
CO5.	Applying the morphological features of botanical evidences like pollens, algae and diatoms useful in crime investigations.	
Course Content:		
Unit-1:	**Forensic Entomology -**Basics of forensic entomology. Insects of forensic importance. Collection of entomological evidence during death investigations, Determining the age of blow fly life cycle stages Determination of PMI	**9 Hours**
Unit-2:	**Forensic Botany:** Botanical evidence encounter in forensic investigation. Identification of wood, Pollen Grains and Diatoms and their forensic importance	**9 Hours**
Unit-3:	**Wildlife Forensics---**Fundamentals and Significance of wildlife forensic. Protected and endangered species of animals and plants. Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants. Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals.	**9 Hours**
Unit-4:	**Microbial Forensic ---**Types and identification of microbial organisms of forensic significance. Bioterrorism	**9 Hours**
Unit-5:	**Forensic ornithology:** Birds flight and means of locomotion, Strikes and collisions, Quarantine issues, Confiscated Bird Goods, Anthropological Arte facts, Applications of Forensic Ornithology, Feather structure and topography.	**12 Hours**
Textbook:	**1.**Forensic biology – Richard Li Forensic Medicine – P.V. Guharaj &M. R. Chandran	
References:	1. Wildlife forensic investigation-Principles and practice: Cooper and Cooper, CRC press 2. Forensic Palynology in the United States of America 3. Forensic Botany: Principles and Applications to Criminal Casework by Heather Miller Coyle(E-book) 4. Forensic Entomology: An Introduction by Dr Dorothy Gennard (E-book)	

Course Code: BFS-S-411 CC-9	**CORE COURSE FORENSIC SCIENCE SEMESTER-IV QUALITY MANAGEMENT IN LABORATORIES**	**L-4 T-0 P-2 C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the concept of Quality management, its various components and its role in the accreditation and certification processes of forensic science laboratories.	
CO2.	Explaining the management and technical requirements for International Standards on which QM in the forensic sciences is based	
CO3.	Classifying the generation of a quality report in reference to the scope of particular evidence	
CO4.	Explaining the process of certification and various accreditation bodies related with Forensic Science	
CO5.	Describing the importance of documentation in the quality assurance.	
Course Content:		
Unit-1:	**Laboratory Management**: Laboratory information management system.	**9 Hours**
Unit-2:	**Quality Management**: (ISO/IEC 17025) General requirements for the competence of testing and calibration laboratories, Introduction, Scope, Management requirements: organization, Quality System, Document Control, Test and calibration methods and methods validation, Equipment, measurement traceability, Sampling, Handling of test and calibration items, Assuring the quality of test calibration results and reporting the results.	**12 Hours**
Unit-3:	**Accreditation and certification** : Accreditation and certification bodies- NABL,ASCLD/LAB, ABC, IAI.	**9 Hours**
Unit-4:	**Report Writing and Evidence Evaluation:** Components of reports and Report formants in respect of Crime Scene and Laboratory findings.	**9 Hours**
Unit-5:	**Cases of Special Importance**: Pertaining to forensic examination (Biology, serology, chemistry, toxicology) documents, fingerprints, ballistics, photography and physics, pertaining to forensic examination of cases	**9 Hours**
Textbook:	1. International Standard on General requirements for the competence of testing and calibration laboratories, 1st Ed., 1999-12-15, ISO/IEC17025:1999(E).	
References:	1. William L. Duncan: Total Quality, Key Terms and Concepts. 2. Murray S. Cooper: Quality control in the Pharmaceutical Industry. 3.ISO 9001: 2000 Quality Management System Design by Jay J. Schlick man(E-book) 4.ISO 9001:2008 Quality management systems Requirements by Asq (E- book)	

Course Code: **BFS-S-405** **DSC-3**	**DISCIPLINE SPECIFIC COURSE** **FORENSIC SCIENCESEMESTER-IV** **FORENSIC DERMATOGLYPHICS**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the fundamental principles of fingerprints on which forensic science is based.	
CO2.	Describing concept of classification and applying the cataloguing of fingerprint patterns.	
CO3.	Explaining the types of fingerprint patterns encountered at scene of crime.	
CO4.	Applying the procedure of physical and chemical techniques of developing fingerprints on crime scene evidence	
CO5.	Analyzing the significance of palm prints, and their historical importance in forensic science.	
Course Content:		
Unit-1:	**Basics of Fingerprints-** Introduction and history, with special reference to India. Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting.	**9 Hours**
Unit-2:	**Types of fingerprints**: Types of Fingerprint patterns. Fingerprint characteristics/minutiae. Plain and rolled fingerprints. Ridge counting. Significance of poroscopy and edgeoscopy	**9 Hours**
Unit-3:	**Classification systems :** cataloguing of fingerprint record.(Henry's System of Classification and its extensions) Single digit Classification, Automated Fingerprint Identification System	**9 Hours**
Unit-4:	**Development of Fingerprints -:** Constituents of sweat residue. Latent fingerprints' detection by physical and chemical techniques. Application of light sources in fingerprint detection. Preservation of developed fingerprints.	**12 Hours**
Unit-5:	**Palm prints:** historical importance and forensic significance fingerprinting the deceased.	**9 Hours**
Textbook:	1. Mehta, M.K; Identification of Thumb impression &cross examination of Fingerprints, N.M. Tripathi Pub. Bombay, 1980.	
References:	1. Bridges, B.C; Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting expert Testimony, Opinion Evidence., Univ. Book Agency,Allhabad,2000 2. Cowger James F; Friction Ridge Skin- Comparison &Identification of Fingerprints, CRC Press, NY,1993 3. Fingerprints: Analysis and Understanding by Mark Hawthorne(E-book) 4. Fingerprints and other ridge skin impressions by Christophe Champod; et al(E-book)	

Course Code: **BFS-S-410** **DSC-4**	**DISCIPLINE SPECIFIC COURSE** **FORENSIC SCIENCE SEMESTER-IV** **APPLIED DIGITAL & CYBER FORENSIC**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be:**	**48 hours**
CO1.	Understanding the concept, principal and working mechanism of forensic auditing	
CO2.	Understanding the objectives and features of the Information Technology Act, 2000 and Application of the provisions enshrined in the Act by gathering data obtained from judicial precedents.	
CO3.	Describing the concept of Electronic world and issue related with cyber security	
CO4.	Examining the different kind of Fraud related with e-commerce and forensic accounting.	
CO5.	Analyzing the importance of a systematic procedure for investigation of data by applying data recovery methods and their significance in cyber security.	
Course Content:		
Unit-1:	**Data and Evidence Recovery –** Computer and cyber forensic basics, Mobile Forensics, Blue-Tooth, Computer Ethics. Data and Evidence Recovery, Data Recovery Tools, Data Recovery Procedures and Ethics, File Transfer Protocol (FTP), Document a "Chain of Custody", Complete time line analysis of computer files based on file creation, file modification and file access, Recover Internet Usage Data, Recover Swap Files/Temporary Files/Cache Files.	**9 Hours**
Unit-2:	**Forensics Auditing-** step-by-step process for securing, investigating, and auditing or assessing various IT environments. Introduction to Forensic Accounting and Fraud Examination; Principles of Forensic Accounting and Fraud Examination; Roles of the Forensic Accountant; Nature of Fraud, Fraud Prevention and Detection, Recognizing the Symptoms of Fraud.	**9 Hours**
Unit-3:	**Fraud Investigation Methods-** Private Sources of Information, Inquiry Methods and Fraud Reports, Honesty Testing, Management of Fraud; Financial Statement Fraud; Revenue-and Inventory-Related Financial Statement Frauds; Liability, Asset, and Inadequate Disclosure Frauds; Fraud Against Organizations, Consumer Fraud; Identification of Theft, Investment Scams, Money Laundering; Bankruptcy, and Tax Fraud, Fraud in E-Commerce; Resolution of Fraud, Being an Expert Witness; common mistakes in fraud risk assessment and examination; Credit Card Frauds, Online Transaction Frauds, Cheque Frauds etc.	**12 Hours**
Unit-4:	**Electronic World –** Introduction, EDI, E-Business, E-Banking, Online payment modes, Mobile Banking E- commerce: Concerns for Ecommerce Growth, Concepts Electronic Communication, PCs and Networking, E- mail, Internet and intranets. EDI, EDI to E-commerce, UN/EDIFACT Concerns for E-commerce Growth, Internet bandwidth, Technical, Security and Legal issues, Business Electronic Commerce providers	**9 Hours**
Unit-5:	**Information Technology Act 2000**: scope, objectives, e- governance, creation, recognition and verification of digital signature digital signature and penalties under it act 2000, certifying authority and controller. Emerging trends in information technology law	**9 Hours**
Textbook:	1. Cyber Law & Crimes (IT Act 2000 & Computer Crime Analysis) by Barkha &Ram Mohan,	
References:	1. Firewalls and Internet Security: Repelling the Wily Hacker , Second Edition Addison 2. E-Commerce: The Cutting Edge of Business by Kamlesh K. Bajaj & Debjani Nag, Tata McGraw-Hill 3. Digital evidence and computer crime: forensic science, computers and the Internet by Eoghan Casey BS MA (E-book)	

Course Code: **TMUGE401** **AECC-5**	**ABILITY ENHANCEMENT COMPULSORY COURSE** **FORENSIC SCIENCE SEMESTER-IV** **ENGLISH COMMUNICATION-IV**	**L-2** **T-0** **P-2** **C-3**
Course Outcomes:	**On completion of the course, the students will be :**	**40 Hours**
CO1.	Remembering and understanding the English grammar and vocabulary.	
CO2.	Understanding the essentials of effective listening and speaking.	
CO3.	Understanding the corporate expectations and professional ethics.	
CO4.	Applying correct vocabulary and sentence construction during professional writing or job interviews.	
CO5.	Analyzing different types of interviews. Drafting resume, C.V. or cover letter.	
Course Content:		
Unit-1:	**Vocabulary & Grammar** 1. Homophones and Homonyms 2. Correction of Common Errors (with recap of English Grammar with its usage in practical context.) 3. Transformation of sentences	**12 Hours**
Unit-2:	**Essence of Effective listening & speaking** Listening short conversation/ recording (TED talks / Speeches by eminent personalities) Critical Review of these above mentioned, Impromptu	**05 Hours**
Unit-3:	**Professional Writing** 1. Proposal: Significance, Types, Structure &AIDA 2. Report Writing: Significance ,Types, Structure& Steps towards Report writing	**08 Hours**
Unit-4:	**Job Oriented Skills** 1. Cover Letter 2. Preparing Résumé and Curriculum-Vitae 3. Interview: Types of Interview, Tips for preparing for Interview and Mock Interview 4. Corporate Expectation & Professional ethics: Skills expected in corporate world	**10 Hours**
Unit-5:	**Value based text reading:** Short story A Bookish Topic – R.K. Narayan	**05 Hours**
Textbooks:	1. Raman Meenakshi & Sharma Sangeeta, "Technical Communication-Principles & Practice" Oxford university press, New Delhi. 2. Mohan K. & Sharma R.C., "Business Correspondence of Report Writing", TMH, New Delhi. 3. Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi.	
References:	1. Kumar Sanjay & Pushplata "Communication Skills" Oxford University Press, New Delhi. 2. Agrawal, Malti "Professional Communication" Krishana Prakashan Media (P) Ltd. Meerut.	

Course Code: **BFS-S-408** **DSEC-4**	**DISCIPLINE SPECIFIC ELECTIVE COURSE** **GROUP -A** **FORENSIC SCIENCE SEMESTER-IV** **PHYSICAL & ORGANIC CHEMISTRY-II**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the fundamentals of solution in reference to the properties of ideal, non-ideal solutions.	
CO2.	Understanding the concepts of electrochemistry and conductance and their applications.	
CO3.	Explaining and analyzing the preparation and reaction of Di azonium salt and amines.	
CO4.	Analyzing the structure of carbohydrate, their chemical properties, reactivity.	
CO5.	Evaluating the various methods of potentiometric titrations.	
Course Content		
Unit-1:	**Solutions:** Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law– Non-ideal solutions. Vapour pressure-composition and temperature-composition Curves of ideal and non- ideal solutions. Distillation of solutions. Lever rule. Azeotropes	**9 Hours**
Unit-2:	**Conductance:** Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions. Transference number and its experimental determination using Hittorf and Moving boundary methods.	**9 Hours**
Unit-3:	**Electrochemistry**: Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. **Potentiometric titrations:** Qualitative treatment (acid-base and oxidation-reduction only)	**9 Hours**
Unit-4:	**Amines and Diazonium salts:** Amines (Aliphatic and Aromatic): (Upto 5 carbons) Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction. Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test with HNO2, Schotten– Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation. Diazonium salts: Preparation: from aromatic amines.	**9 Hours**
Unit-5:	**Carbohydrates**: Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation,. Structure of disaccharides (Sucrose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation.	**12 Hours**
Textbook:	1. G. M. Barrow: Physical Chemistry Tata McGraw Hill (2007).	
References:	1. J. C. Kotz, P. M. Treichel, J. R. Townsend, General Chemistry, Cengage Learning India Pvt. Ltd.: New Delhi (2009). 2. H. Mahan: University Chemistry, 3rd Edn. Narosa (1998). 3. The physical basis of chemistry by Warren S. Warren (E-book) 4. A Text-Book of Practical Organic Chemistry Including Qualitative Organic Analysis by Arthur Israel Vogel(E-book)	

Course Code: **BFS-S-409** **DSEC-4**	**DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -B** **FORENSIC SCIENCE SEMESTER-IV** **WAVE & OPTICS**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the concept of geometrical optics including the wave motion	
CO2.	Describing the superposition of a range of collinear and mutually perpendicular simple harmonic motions and their applications.	
CO3.	Explaining the different types of waves and their velocities: Plane, Spherical, Transverse, Longitudinal and the concept of concept of temporal and spatial coherence	
CO4.	Identifying the basic and advanced concept of holography, interference and diffraction	
CO5.	Applying the Fraunhoffer Diffraction from apertures: Rectangular, Slit, Double Slit, Grating, Circular apertures.	
Course Content:		
Unit-1:	**Geometrical optics:** Fermat's principle, reflection and refraction at plane interface, Application to thick lenses, Ramsden and Huygens eyepiece. **Wave Motion:** Plane and Spherical Waves. Longitudinal and Transverse Waves, Plane Progressive (Travelling) Waves.	**9 Hours**
Unit-2:	**Superposition of two perpendicular Harmonic Oscillations**: Graphical and Analytical methods. Lissajous Figures (1:1 and 1:2) and their uses. Superposition of N harmonic waves.	**9 Hours**
Unit-3:	**Wave Optics:** Electromagnetic nature of light. Definition and properties of wave front, Huygens's Principle. Temporal and Spatial Coherence.	**9 Hours**
Unit-4:	**Fraunhofer diffraction**: Single slit, double slit & nth slits, Diffraction grating. Resolving Power of a telescope Resolving power of grating.	**9 Hours**
Unit-5:	**Holography**: Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves	**12 Hours**
Textbook:	1. Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw Hill.	
References:	1. Optics, (2017), 6th Edition, Ajoy Ghatak, McGraw-Hill Education, New Delhi 2. The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons. 3. Guided Wave Optical Components and Devices: Basics, Technology, and Applications by Bishnu P. Pal(E-book) 4. Guided Wave Optics by Alan Rolf Mickelson (E-book)	

NOTE	Course Outcomes of following Practical's are covered in their respective theory courses.	
Course Code: BFS-S-453 SEC-10 12 HOURS	**SKILL ENHANCEMENT COURSE FORENSIC SCIENCE SEMESTER-IV FORENSIC BIOLOGY - II (LAB)**	**L-0 T-0 P-2 C-1**
1	Identification and culture of bacteria of forensic significance.	
2	Identification of birds from feathers.	
3	Identification of orders of insects and other arthropods of forensic significance	
4	To carry out microscopic examination of pollen grains.	
5	To carry out microscopic examination of diatoms.	
6	To cite a crime case in which diatoms have served as forensic evidence.	
7	To prepare a case report on forensic entomology.	
8	To Prepare a case report on identification of any wild life materials such as teeth, flowers and such as skin, fur, bones, nails, horn plant.	

Course Code: BFS-S-455 SEC-11 12 HOURS	**SKILL ENHANCEMENT COURSE FORENSIC SCIENCE SEMESTER-IV FORENSIC DERMATOGLYPHICS (LAB)**	**L-0 T-0 P-2 C-1**
1	To record plain and rolled fingerprints.	
2	To identify different fingerprint patterns.	
3	To carry out ten digit classification of fingerprints.	
4	To identify core and delta.	
5	To Classify core and delta	
6	To identify different ridge characteristics.	
7	To carry out ridge tracing and ridge counting.	
8	Document and Fingerprint Photography.	
9	To take Plain and Rolled inked fingerprints and to identify the patterns.	
10	To develop Latent fingerprints with Powder method.	

Course Code: BFS-S-456 SEC-12 12 HOURS	**SKILL ENHANCEMENT COURSE FORENSIC SCIENCE SEMESTER- IV APPLIED DIGITAL & CYBER FORENSIC (LAB)**	**L-0 T-0 P-2 C-1**
1	Data Recovery integrated with forensic technology.	
2	Access Data e- Discovery.	
3	Creation & verification of Digital Signature.	
4	Network Analysis.	
5	Detail Analysis of E-mail, E-Mail Investigation, E-Mail Tracking, IP Tracking, Email Recovery.	
6	To Prepare a case report on Working of Encase Software.	
7	Image processing using tools like, Photoshop, Corel Photo paint etc.	

Course Code: **BFS-S-458** **DSEC-4** **12HOURS**	**DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A** **FORENSIC SCIENCE SEMESTER-IV** **PHYSICAL & ORGANIC CHEMISTRY (LAB)**	**L-0** **T-0** **P-2** **C-1**
1.	**Phase equilibria** 1. Construction of the phase diagram of a binary system (simple eutectic) using cooling curves. 2. Determination of the critical solution temperature and composition of the phenol water system and study of the effect of impurities on it. 3. Study of the variation of mutual solubility temperature with concentration for the phenol water system and determination of the critical solubility temperature. **Conductance** 1. Determination of cell constant 2. Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid. 3. Perform the following conduct metric titrations: 4. Strong acid vs. strong base 5. Weak acid vs. strong base **Potentiometry:** Perform the following potentiometric titrations: 1. Strong acid vs. strong base 2. Weak acid vs. strong base 3. Potassium dichromate vs. Mohr's salt	
2.	**Organic Chemistry** 1. Systematic Qualitative Organic Analysis of Organic Compounds possessing mono functional groups (- COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative. 2. Separation of amino acids by paper chromatography 3. Determination of the concentration of glycine solution by formylation method. 4. Titration curve of glycine	

Course Code: **BFS-S-459** **DSEC-4** **12 HOURS**	**DISCIPLINE SPECIFIC ELECTIVE COURSE** **GROUP -B** **FORENSIC SCIENCE SEMESTER-III** **WAVES & OPTICS (LAB)**	**L-0** **T-0** **P-2** **C-1**
1	To determine the frequency of an electric tuning fork by Melde's experiment and verify λ^2 –law.	
2	To investigate the motion of coupled oscillators.	
3	To study Lissajous Figures.	
4	Familiarization with: Schuster`s focusing; determination of angle of prism.	
5	To determine refractive index of the Material of a prism using sodium source.	
6	To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.	
7	To determine the wavelength of sodium source using Michelson's interferometer.	
8	To determine wavelength of sodium light using Fresnel Bi-prism.	
9	To determine wavelength of sodium light using Newton's Rings.	
10	To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.	
11	To determine wavelength of (1) Na source or (2) spectral lines of Hg source using plane diffraction grating.	

Course Code: **TMUGS-401** **VAC-II**	**VALUE ADDED COURSE (VAC)-II** **FORENSIC SCIENCE SEMESTER-IV** **MANAGING WORK AND OTHERS**	**L-2** **T-1** **P-0** **C-0**
Course Outcomes:	**On completion of the course, the students will be:**	**30 Hours**
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	**Intrapersonal Skills:** Creativity and Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	**08 Hours**
Unit-2:	**Interpersonal Skills:** Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organizations Manners, etiquette and net etiquette	**12 Hours**
Unit-3:	**Interview Techniques:** Job Seeking Group discussion (GD) Personal Interview	**10 Hours**
References:	1. Robbins,StephenP.,Judge,TimothyA.,Vohra,Neharika,OrganizationalBehaviour (2018), 18th ed., Pearson Education 2. Burne, Eric, Games People Play (2010), Penguin UK 3. Carnegie, Dale, How to win friends and influence people (2004),RHUK 4. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017),Macmillan 5. Steinburg, Scott, Nettiquette Essentials (2013),Lulu.com ***1. https://www.hloom.com/resumes/creative-templates/*** ***2. https://www.mbauniverse.com/group-discussion/topic.php*** ***3. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to- make-a-great-impression*** **** Latest editions of all the suggested books are recommended.***	

Course Code: BFS-S-510 CC-10	**CORE COURSE FORENSIC SCIENCE SEMESTER-V INTRODUCTION TO RESEARCH METHODOLOGY**	**L-4 T-0 P-2 C-5**
Course Outcomes:	**On completion of the course, the students will be:**	**48 hours**
CO1.	Understanding the concept of research, research types, goals and criteria of a good research, research process formulation, and research-related ethical issues.	
CO2.	Describing the concept of data collection, sampling & scaling techniques used in research design.	
CO3.	Applying the process of designing a research study from its inception to its report writing and its various components	
CO4.	Analyzing the data analysis-and hypothesis testing procedures in research.	
CO5.	Evaluating the interpretation of data in research methodology.	
Course Content:		
Unit-1:	**Research:** Nature, Definition and Purposes; scientific attitudes theory formation: Inductive, Deductive-Reasoning; Types of research studies: Descriptive, Analytical, Exploratory and Doctrinal	**7 Hours**
Unit-2:	**Steps in Research**: Primary and Secondary - Independent and Dependent variables; Main steps in Social Research types: Formulation of research problem, selecting of problem, study area, etc; Review of Literature; Sample collection; Data Analysis and Report Writing	**10 Hours**
Unit-3:	**Hypothesis and Sampling Hypothesis:** Definition, types and sources; Research Design: Meaning and types; Reliability and validity; sampling: Non-Probability and Probability types;	**10 Hours**
Unit-4:	**Methods of data collection:** Pilot study, observation, Questionnaire, Interviewing, Case study method; Unobtrusive measures, Secondary data collection.	**9 Hours**
Unit-5:	**Data Analysis:** Types of data: qualitative and quantitative; Analysis and interpretation of data, Data processing; Content analysis; Survey method measurement and types of scales. Ethics in Research: Researcher Fraud and Plagiarism, Confidentiality in Research	**12 Hours**
Textbook:	1. Research Methodology & Biostatistics by CR Kothari	
References:	1. Mausner & Bahn: Epidemiology-An Introductory text, 2nd Ed., W. B. Saunders Co. 2. Richard F. Morton &J. Richard Hebd: A study guide to Epidemiology and Biostatistics, 2nd Ed., University Park Press, Baltimore. 3. Introduction to research methods by Bora Pajo 4. Research methodology by Ranjit Kumar	

COURSECODE: **BFS-S-505** **DSC-5**	**DISCIPLINE SPECIFIC COURSE** **FORENSIC SCIENCE SEMESTER-V** **FORENSIC BALLISTICS**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the historical Development of the Forensic Ballistics and concept of Firearms, their Classification and working mechanism.	
CO2.	Explaining the definition, identification and examination of internal, external and terminal ballistics.	
CO3.	Describing the ammunitions, their identification, origin etc. with focus on improvised/ country made Imitative firearms and their constructional features.	
CO4.	Applying the importance of Gunshot Residue in reconstructing the case related to forensic ballistics.	
CO5.	Analyzing the bullets, cartridge cases, GRS (Gunshot residue) through various chemical and Instrumental Methods	
Course Content:		
Unit-1:	**Firearms-**History and development of firearms. Classification of firearms. Weapon types and their operation. Firing mechanisms of different firearms. **Internal ballistics** – Definition, ignition of propellants, shape and size of propellants, manner of burning, and various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting.	**9 Hours**
Unit-2:	**External Ballistics –** Vacuum trajectory, effect of air resistance on trajectory, base drag, drop, drift, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity, Measurements of trajectory parameters. **Terminal Ballistics –** Effect of projectile on hitting the target: function of bullet shape, striking velocity, striking angle and nature of target, effect of instability of bullet, Ricochet and its effects.	**9 Hours**
Unit-3:	**Ammunition -** Types of ammunition characteristics of different types of cartridges and bullets. Primers and priming compounds. Projectiles. Different types of marks produced during firing process on cartridge – firing pin marks, breech face marks, chamber marks, extractor and ejector marks.	**9 Hours**
Unit-4:	**Firearm Evidence -** Matching of bullets and cartridge cases in regular firearms. Identification of bullets, pellets and wads fired from improvised, country made firearms. Automated method of bullet and cartridge case comparison. Determination of range of fire.	**9 Hours**
Unit-5:	**Examination of Gunshot Residues**: Characterization of GSR, 12 Hrs. Methods of analysis of gunshot residues from shooting hands and targets, with special reference to clothing. Identification and nature of firearms injuries. Reconstruction with respect to accident, suicide, murder and self defence.	**12 Hours**
Textbook:	1. Sharma, B.R.; Firearms in Criminal Investigation & Trials, 4th Ed, Universal Law Publishing Co Pvt Ltd, New Delhi,2011.	
Reference:	1. Schooeble, A.J.and Exline,L.D; Current methods in Forensic Gunshot Residue Analysis, CRC Press, New York,2000. 2. W.G. Eckert and R.K. Wright in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton(1997). 3. Forensic ballistic in criminal justice by K.Kumar 4. Ballistics in court by Brian J.Heard	

Course Code: **BFS-S-503** **DSC-6**	**DISCIPLINE SPECIFIC COURSE** **FORENSIC SCIENCE SEMESTER-V** **SEROLOGY & DNA TYPING**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the fundamentals of DNA structure and examine the importance of the different steps involved in DNA typing.	
CO2.	Explaining the concept of serogenetic and genetic markers	
CO3.	Applying the various serological techniques used to evaluating the blood samples for criminal investigation. In examination of disputed identity cases employed in forensic science.	
CO4.	Applying the significance of markers in individualization of an individual and its admissibility as an evidence in court and report writing.	
CO5.	Analyzing the significance of DNA profiling in forensic science through case studies	
Course Content:		
Unit-1:	**Forensic Serology I-**Determination of human and animal origin from bones, hairs, nails, skin, body tissue; differentiation of blood, menstrual blood. Serogenetic markers; Blood groups – biochemistry and genetics of ABO, Rh, MN systems, Lewis antigen, Bombay Blood group, determination of secretor / non secretor.	**9 Hours**
Unit-2:	**Forensic Serology II**- Polymorphic enzymes typing – PGM, ESD, AK, etc., and their forensic significance, HLA typing, paternity disputes etc.	**9 Hours**
Unit-3:	**Genetics and DNA fingerprinting**: Genetics-Introduction; Deoxyribose Nucleic Acid – Structural properties Sources of DNA evidence; DNA Extraction-Basic Principles -Method of DNA extraction; DNA Quantification -Slot Blot Assay, Southern /Northern Blotting ; DNA Amplification by Polymerase Chain Reaction	**9 Hours**
Unit-4:	**Forensic DNA Typing** - Polymorphism in DNA system, DNA markers RFLP, RAPD, VNTRs, SNP, Autosomal –STR, YSTR, Mitochondrial DNA. Touch DNA. Forensic applications of DNA Typing.	**9 Hours**
Unit-5:	**DNA data base & its legal perspectives:** DNA data base; DNA data basing and Human Genome Project, Role of DNA data basing in identifying unrecognizable bodies. Legal standards for admissibility of DNA profiling, procedural and ethical concerns, status of development of DNA profiling in India and abroad.	**12 Hours**
Textbook:	**1.** K. Inman and N. Rudin, An Introduction to Forensic DNA Analysis, CRC Press, Boca Raton (1997).	
References:	1. . J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005). . 2. DNA structure and function R.R Sinden, 1994 academic press. A laboratory guide for serological and DNA typing by J. Thomas McClintock 3. Non human DNA typing: Theory and casework applications by Heather Miller Coyle	

Course Code: BFS-S-506 DSC-7	**DISCIPLINE SPECIFIC COURSE FORENSIC SCIENCE SEMESTER-V QUESTIONED DOCUMENTS**	**L-4 T-0 P-2 C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the concept, classification, handling and preservation of questioned document examination.	
CO2.	Identifying the concept of different types of frauds and forgeries by analyzing questioned documents	
CO3.	Applying the principles, general characteristics, individual characteristics, variability of handwriting, and analyzing this in comparing hand writing samples with unknown	
CO4.	Analyzing the concept of Forensic Linguistics and Stylistics in Questioned document.	
CO5.	Evaluating the analysis of charred documents and to determine whether the suspected currency note is genuine or forged.	
Course Content:		
Unit-1:	**Introduction to Questioned Documents –** Definition types of questioned documents. Handling, care, preservation and marking of Questioned Documents, Preliminary examination of questioned documents. Basic tools needed for Questioned documents.	**8 Hours**
Unit-2:	**Paper and ink examination:** Determining the age and relative age of documents. Analysis and Comparison of paper and ink. Different types of printers and analysis of printed documents. Study of typescripts and typewriter characteristics and analysis of typed documents	**8 Hours**
Unit-3:	**Introduction to Handwriting Analysis** - Principles of Handwriting Identification. Development of individuality in handwriting. Class and individual characteristics of handwriting. Natural variations, Disguise and fundamental divergences in handwritings. Class and individual characteristics. Comparison of handwriting. Merits and demerits of exemplar and non exemplar samples during comparison of handwriting. Types and Collection of Standards for comparison of handwriting.	**11 Hours**
Unit-4:	**Forgeries –** Different types of Forgeries (Freehand and Traced). Alterations in documents, including erasures, additions, over writings and obliterations. Study of indented and invisible writings.	**9 Hours**
Unit-5:	**Analysis of Charred documents**. Examination of counterfeit Indian currency notes, passports, visas and stamp papers. Determination of authorship in Disguised writing and anonymous letters (considering Forensic Linguistics and Stylistics, natural variation, class characteristics and individual characteristics of handwriting).	**12 Hours**
Textbook:	1. S Osborn, Questioned Documents, Boyd Printing co, Chicago (1929)	
References:	1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence n Civil and Criminal Cases, 4th Edition, Foundation Press, New York (1995). 2. Suspected Documents and their Scientific Examination, Harison 3. Scientific examination of Documents by Stephen Day David Ellen.	

Course Code: **BFS-S-508** **DSEC-5**	**DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A** **FORENSIC SCIENCE SEMESTER-V** **INORGANIC & PHYSICAL CHEMISTRY-I**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the fundamental principles of metallurgy and applications in various fields of metals and alloy behavior and their manufacturing processes	
CO2.	Understanding the Structure, bonding of s and p block materials and their oxides/compounds	
CO3.	Describing chemical kinetics: determination of order, molecularity, and theories of reaction rates determination of rate of opposing/parallel/chain reactions	
CO4.	Applying the Preparation, Properties And Reactions Of Hydrides Of Nitrogen, Halides And Oxohalides.	
CO5.	Analyzing the Concept of activation energy and its calculation from Arrhenius equation.	
Course Content:		
Unit-1:	**General Principles of Metallurgy**: Ellingham diagrams for reduction of metal oxides using carbon as reducing agent. Hydrometallurgy, Methods of purification of metals (Al, Pb, Ti, Fe, Cu, Ni, Zn): electrolytic, oxidative refining, Kroll process, Parting process, van Arkel-de Boer process and Mond's process.	**9 Hours**
Unit-2:	**Compounds of s- and p-Block Elements:** Hydrides and their classification (ionic, covalent and interstitial), structure and properties with respect to stability of hydrides of p- block elements. Concept of multicentre bonding (diborane): Structure, bonding and their important properties like oxidation/reduction, acidic/basic nature of the following compounds and their applications in industrial, chemistry.	**8 Hours**
Unit-3:	**Hydrides of nitrogen**: (NH3, N2H4, N3H, NH2OH) Oxoacids of P, S and Cl. Halides and oxohalides: PCl3, PCl5, SOCl2 and SO2Cl2.	**8 Hours**
Unit-4:	**Liquids:** Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only)	**11 Hours**
Unit-5:	**Chemical Kinetics**: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations reactants). Half–life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions.	**12 Hours**
Textbook:	1. . G. M. Barrow: Physical Chemistry Tata McGraw Hill (2007).	
References:	1. F.A. Cotton & G. Wilkinson: Basic Inorganic Chemistry, John Wile 2. D. F. Shriver and P. W. Atkins: Inorganic Chemistry, Oxford University Press 3. Advance inorganic chemistry by Prof, Joel Rosenthal 4. Chemical reaction in inorganic chemistry by Chandra Leka Saravanan	

Course Code: **BFS-S-509** **DSEC-5**	**DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -B** **FORENSIC SCIENCE SEMESTER-V** **THERMAL PHYSICS**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Remembering the basic concepts of thermodynamics, the first and the second law of thermodynamics.	
CO2.	Explaining entropy and the associated theorems, the thermodynamic potentials and their physical interpretations.	
CO3.	Describing the kinetic theory of gases, Maxwell-Boltzman distribution law, equitation of energies, mean free path of molecular collisions, viscosity, thermal conductivity	
CO4.	Applying Fundamental concept of ideal and real gas in physics reactions	
CO5.	Analyzing the Behavior of Real Gases.	
Course Content:		
Unit-1:	**Introduction to Thermodynamics:** First & Second Law of Thermodynamics: Thermodynamic Variables & Equilibrium, Concept of Temperature, Work & Heat, Internal Energy, Applications of First Law.	**8 Hours**
Unit-2:	**Entropy & Thermodynamic Potentials:** Concept of Entropy, Clausius Theorem. Second Law of Thermodynamics in terms of Entropy. Principle of Increase of Entropy. Entropy Changes in Reversible and Irreversible processes with examples. Entropy of the Universe. Principle of Increase of Entropy. Temperature–Entropy diagrams. Third Law of Thermodynamics	**8 Hours**
Unit-3:	**Maxwell's Thermodynamic Relations:** Derivations and applications of Maxwell's Relations. Values of Cp-Cv, TdS Equations, Joule-Kelvin coefficient for Ideal and Van der Waal Gases, Energy equations, Change of Temperature during Adiabatic Process	**10 Hours**
Unit-4:	**Kinetic Theory of Gases:** Distribution of Velocities, Molecular Collisions, Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification. Degrees of Freedom. Law of Equipartition of Energy (No proof required). Specific heats of Gases, Mean Free Path. Collision Probability.	**10 Hours**
Unit-5:	**Real Gases:** Behavior of Real Gases: Deviations from the Ideal Gas Equation. Critical Constants. Continuity of Liquid and Gaseous State. Vapour and Gas. Boyle Temperature. Van der Waal's Equation of State for Real Gases.	**12 Hours**
Textbook:	1. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, McGraw-Hill.	
References:	1. Thermodynamics, Kinetic Theory& Statistical Thermodynamics, Sears & Salinger. Narosa. 2. Concepts in Thermal Physics, S.J. Blundell and K.M. Blundell, Oxford University Press 3. Thermal physics by David Goodstein	

NOTE	Course Outcomes of following Practical's are covered in their respective theory courses.	
Course Code: BFS-S-555 SEC-13 12 HOURS	**SKILL ENHANCEMENT COURSE (SEC) FORENSIC SCIENCE SEMESTER-V FORENSIC BALLISTIC (LAB)**	**L-0 T-0 P-2 C-1**
1	To correlate the striking angle of the bullet with the impact on the target.	
2	To estimate the range of fired bullets.	
3	To identify gunshot residue.	
4	To correlate the nature of injuries with distance from which the bullet was fired.	
5	To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.	

Course Code: BFS-S-557 SEC-14 12 HOURS	**SKILL ENHANCEMENT COURSE (SEC) FORENSIC SCIENCE SEMESTER-V SEROLOGY AND DNA TYPING (LAB)**	**L-0 T-0 P-2 C-1**
1	To determine titre of antisera.	
2	To perform precipitin test for species of origin determination.	
3	To perform Immunodiffusion test for species of origin.	
4	To perform preliminary microscopic examination of peripheral and menstrual blood.	
5	To perform Barberios test for seminal stain identification.	
6	Blood grouping from stains of blood by Absorption inhibition, Absorption-elution and mixed agglutination technique.	

Course Code: BFS-S-556 SEC-15 12 HOURS	**SKILL ENHANCEMENT COURSE (SEC) FORENSIC SCIENCE SEMESTER-V QUESTIONED DOCUMENT (LAB)**	**L-0 T-0 P-2 C-1**
1	To identify handwriting characters (class and individual).	
2	To study free hand forgery and traced forgery.	
3	To study erasures, alterations and obliterations in handwriting samples.	
4	To compare handwriting samples.	
5	To study secret writings & indented writings.	
6	To study counterfeit currency notes, passports and visa.	

Course Code: BFS-S-558 DSEC-5 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-V PHYSICAL & ORGANIC CHEMISTRY- I (LAB)	L-0 T-0 P-2 C-1
1.	**Inorganic Chemistry:** Semi -micro qualitative analysis using H2S of mixtures- not more than four ionic species (two anions and two cations and excluding insoluble salts) out of the following: 1. Cations : NH +, Pb +, Ag+, Bi +, Cu +, Cd +, Sn +, Fe +, Al +, Co +, Cr +, Ni +, Mn +, Zn2+, Ba2+, Sr2+, Ca2+, K+ 2. Anions: CO 2– , S2–, SO2–, S O 2–, NO –, CH COO–, Cl–, Br–, I–, NO –,SO 2-, PO 3-,BO33-,C2O42–, F– (Spot tests should be carried out wherever feasible).	
2.	**Physical Chemistry:** 1. Surface tension measurement (use of organic solvents excluded). a. Determination of the surface tension of a liquid or a dilute solution using a stalagmometer. b. Study of the variation of surface tension of a detergent solution with concentration. 2. Viscosity measurement (use of organic solvents excluded). a. Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer. b. Study of the variation of viscosity of an aqueous solution with concentration of solute. 3. Chemical Kinetics--Study the kinetics of the following reactions. a. Initial rate method: Iodide-persulphate reaction. b. Integrated rate method. c. Acid hydrolysis of methyl acetate with hydrochloric acid. d. Saponification of ethyl acetate. e. Compare the strengths of HCl and H2SO4 by studying kinetics of hydrolysis of methyl.	

Course Code: BFS-S-559 DSEC-5 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-V THERMAL PHYSICS (LAB)	L-0 T-0 P-2 C-1
1	To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus.	
2	To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method.	
3	To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).	
4	To study the variation of Thermo-EMF of a Thermocouple with Difference of Temperature of its Two Junctions.	
5	To calibrate a thermocouple to measure temperature in a specified Range using (1) Null Method, (2) Direct measurement using Op-Amp difference amplifier and to determine Neutral Temperature.	

Course Code: **BFS-S-603** **CC-11**	**CORE COURSE** **FORENSIC SCIENCE SEMESTER-VI** **TECHNOLOGICAL METHODS IN FORENSIC SCIENCE**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the basic principles and theory of chromatographic and Electrophoresis techniques their usefulness in processing of crime scene evidence	
CO2.	Describing the concept of Spectroscopy, electromagnetic spectrum, sources of radiation their relevance in crime scene investigation	
CO3.	Applying the principles of Electrophoretic, chromatographic and spectroscopic techniques and their application in identifying chemical and biological materials.	
CO4.	Analyzing the laboratory procedures of chromatographic and Electrophoresis and spectroscopic	
CO5.	Evaluating the working of microscopy in visualizing trace evidence and comparing it with control samples.	
Course Content:		
Unit-1:	**GC & HPLC:** principles, instrumentations and technique, columns, stationary phases, detectors, Forensic applications. HPLC: theory, Instrumentation, Technique, column, detectors, LC-MS, Forensic applications.	**9 Hours**
Unit-2:	**Microscopy**: Stereomicroscope, Comparison microscope, Electron Microscopy: TEM, SEM and their forensic Application.	**9 Hours**
Unit-3:	**Electrophoresis Technique:** General principles, Factors affecting electrophoresis, Sodium dodecyl sulphate (SDS) polyacrylamide gel electrophoresis, Agrose gel electrophoresis, Gel immune-diffusion, Immuno- electrophoresis.	**10 Hours**
Unit-4:	**Basic Spectroscopy--** Introduction, electromagnetic radiations, full range, UV-Visible – principal absorbance, transmittance, Beer-Lambert's laws and its applications IR-molecular spectra, electronics, vibrational, rotational spectra. Principles, diagrams, working and construction, uses and applications	**10 Hours**
Unit-5:	**AAS & MASS Spectroscopy** - Introduction, Basic principles, Instrumentation and Techniques, Forensic applications. MASS Spectroscopy- Principle, Instrumentation and working, Forensic applications.	**10 Hours**
Textbooks:	1. D.A. Skoog, D.M. West and F.J. Holler, Fundamentals of Analytical Chemistry. 2. Srivastava Meena, Yadav R. S Principles Of Laboratory Techniques And Methods.	
References:	1. J.W. Robinson, Undergraduate Instrumental Analysis, 5th Edition, Marcel Dekker, Inc., New York (1995). 2 "Principles of Instrumental Analysis" by Douglas A. Skoog, James Holler, Stanley R. Crounch 3. "Instrumental Methods of Analysis" by Willard H.W Merritt, L.L Dean, J .A .Settie FA	

Course Code: **BFS-S-606** **DSC-8**	**DISCIPLINE SPECIFIC COURSE** **FORENSIC SCIENCE SEMESTER-VI** **FORENSIC TOXICOLOGY**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the concept of Forensic Toxicology, poisons and Drugs classification and nature of the toxicological investigations undertaken in forensic laboratories	
CO2.	Understanding the concept of Narcotic Drugs & Psychotropic Substances Act 1985.	
CO3.	Identifying the signs and symptoms of common poisoning (Corrosives, Irritants, Neurotropic, Asphyxiants, Cardiac, Spinal and Miscellaneous group).	
CO4.	Applying a complete knowledge to all laboratory procedures for the examination of biological and non biological evidence containing unknown drugs through systematic analysis	
CO5.	Analyzing the toxicological signs & symptoms of toxins and their pharmacological effect on the body when administered through case study.	
Course Content:		
Unit-1:	I**ntroduction to Forensic Toxicology: Classification** of Toxicology, Forensic toxicology .significance of toxicological findings. Techniques used in Forensic toxicology.	**9 Hours**
Unit-2:	**Poisons**--Classification of poisons. Physico-chemical characteristics and mode of action of poisons. Accidental, suicidal and homicidal poisonings .Signs and symptoms of common poisoning and their antidotes. Metabolism and excretion of poisons.	**9 Hours**
Unit-3:	**Narcotics Drugs and Psychotropic Substances**-Definition of narcotics, drugs and psychotropic substances. Broad classification – Narcotics, stimulants, depressants and hallucinogens. General characteristics and common example of each classification.	**9 Hours**
Unit-4:	**Collection Preservation and analysis**-Collection and preservation of viscera, blood and urine for various poison and drug cases. Introduction of Screening and Presumptive, chemical and instrumental analysis of drugs and poisons	**9 Hours**
Unit-5:	**Acts related to Forensic Toxicology** 1. Narcotic Drugs & Psychotropic Substances Act 1985 (Definition, Licit Opium Cultivation Minimum and Commercial Quantity in Narcotic Drugs, Offences and Penalties) 2. The Poisons Act, 1919, and Section 284 of IPC, 1860 (Negligent conduct with respect to Poisonous substance). 3. Drugs & Cosmetics Act 1945 (Definition, Adulterated, Misbranded, Spurious Drugs and Cosmetics, Offenses and Penalties	**12 Hours**
Textbook:	1. Professor K.S. Narayan Reddy The Essentials Of Forensic Medicine And Toxicology	
References:	1. Poklis, Forensic toxicology in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton(1997). 2.Principles of Forensic Toxicology Barry Levine ,Amer. Assoc. for Clinical Chemistry, 2003 3. Forensic medicine and toxicology by Anil Agarwal 4. Aids to Forensic Medicine and toxicology by W.G. Aitchison Robertson	

Course Code: **BFS-S-604** **DSC-9**	**DISCIPLINE SPECIFIC COURSE** **FORENSIC SCIENCE SEMESTER-VI** **FORENSIC PSYCHOLOGY**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the concept of forensic psychology and its significance in crime scene investigation	
CO2.	Describing the objectives of mental health act and chapters and section related with mental health provisions of a mentally ill person.	
CO3.	Explaining the interface of psychology and the law, with a specific focus on sec 84 of insanity.	
CO4.	Applying the concept of psychological based investigative techniques like polygraph, Narcoanalysis and brain electrical oscillation signatures used in deception of truth.	
CO5.	Analyzing the concept of Nature of Insanity, insanity defense through various case studies	
Course Content:		
Unit-1:	**Basics of Forensic Psychology:** History of Forensic Psychology, Defining Forensic Psychology, Ethical Standards of Forensic Psychology, Services provided by Forensic Psychologists.	**10 Hours**
Unit-2:	**Juvenile Delinquency**: Concept Juvenile delinquency, its causes and types. Child abuse (physical, sexual, emotional), Antisocial Personality Disorder.	**10 Hours**
Unit-3:	**Investigative Psychology:** 1. Criminal profiling 2. Polygraph 3. NarcoAnalysis 4. BEOS	**9 Hours**
Unit-4:	**Psychology and Law:** Application of Forensic Psychology in Civil and Criminal Legal Proceedings Naughten's rule insanity – Nature of Insanity, insanity defense.	**9 Hours**
Unit-5:	**Legal aspect**: Mental Health Act, 1987 [Reception Order, Object, Establishment or Maintenance of Psychiatric Hospitals and Psychiatric Nursing Homes, Procedures on Production of Mentally Ill Person in front of Magistrate].	**10 Hours**
Textbook:	1. Handbook of Forensic Psychology', Prof Dr. Vimala Veeraraghwan, Edition 1st.	
References:	1. Handbook of Forensic Psychology', Irving B. Weiner, Allen K. Hiss, Edition 3rd, 2006, Wiley Publication. 2. Theoretical Psychology', Moazziz Ali Beg, Sangeeta Gupta Beg, Vol [04], Edition2nd, 2013, Global Vision Publishing House, New Delhi. 3. Criminal Psychology by Hans Gross. 4. Forensic Psychology by David A. Crighton.	

Course Code: **BFS-S-608** **DSEC-6**	**DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A** **FORENSIC SCIENCE SEMESTER-VI** **INORGANIC AND PHYSICALCHEMISTRY-II**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the properties of transition metals like variable oxidation states, color, magnetic and catalytic properties	
CO2.	Describing the concept of vibrational motion in physical chemistry	
CO3.	Explaining the Schrodinger wave equation for Rigid rotor and Linear harmonic oscillator and calculate their respective energies.	
CO4.	Applying the fundamentals of photochemistry and laws governing it such as Beer Lambert law	
CO5.	Applying the quantum mechanical operators, quantization, probability distribution, uncertainty principle and application of quantization to spectroscopy.	
Course Content:		
Unit-1:	**Transition Elements (3d Series):** General group trends with special reference to electronic configuration, variable valency, color, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.	**9 Hours**
Unit-2:	**Crystal Field Theory**: Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination	**10 Hours**
Unit-3:	**Quantum Chemistry & Spectroscopy**: Spectroscopy and its importance in chemistry. Wave-particle duality. Link between spectroscopy and quantum chemistry. Electromagnetic radiation and its interaction with matter. Types of spectroscopy. Difference between atomic and molecular spectra. Born- Oppenheimer approximation: Separation of molecular energies into translational, rotational, Vibrational And Electronic Components.	**8 Hours**
Unit-4:	**Rotational Motion:** Schrödinger equation of a rigid rotator and brief discussion of its results (solution not required). Quantization of rotational energy levels. Microwave (pure rotational) spectra of diatomic molecules. Selection rules. Structural information derived from rotational spectroscopy. Vibrational Motion: Schrödinger equation of a linear harmonic oscillator and brief discussion of its results (solution not required). Quantization of vibrational energy levels. Selection rules, IR spectra of diatomic molecules. Structural information derived from vibrational spectra. Vibrations of polyatomic molecules.	**9 Hours**
Unit-5:	**Photochemistry:** Laws of photochemistry**,** Lambert-Beer's law. Fluorescence and phosphorescence. Quantum efficiency and reasons for high and low quantum yields. Primary and secondary processes in photochemical reactions. Photochemical and thermal reactions. Photoelectric cells.	**12 Hours**
Textbook:	1. G. M. Barrow: Physical Chemistry Tata McGraw Hill (2007).	
References:	1. Kotz, P. M. Treichel &J. R. Townsend: General Chemistry, Cengage Lening India Pvt. Ltd., New Delhi (2009). 2. H. Mahan: University Chemistry 3rd Ed. Narosa (1998). 3.Advance inorganic chemistry by Prof, Joel Rosenthal	

Course Code: **BFS-S-609** **DSEC-6**	**DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -B** **FORENSIC SCIENCE SEMESTER-VI** **SOLID STATE PHYSICS**	**L-4** **T-0** **P-2** **C-5**
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding the concept of lattice, crystals and such as the reciprocal lattice and the Brillouin zone and the dynamics of atoms and electrons in solids and diffraction of X-rays by solids to determine the crystal structure.	
CO2.	Describing the concept of Type I and type II Superconductors.	
CO3.	Identifying the origin of the dielectric properties exhibited by solids and the concept of polarizability	
CO4.	Applying the basics of phase transitions and the preliminary concept and experiments related to Superconductivity in solid.	
CO5.	Applying the fundamentals of the elementary lattice dynamics and its influence on the properties of materials as well as concept of lattice vibrations, phonons.	
Course Content:		
Unit-1:	**Crystal Structure: Solids:** Amorphous and Crystalline Materials. Lattice: Translation Vectors, Lattice with a Basis Unit Cell, Miller Indices, Reciprocal Lattice, Types of Lattices, Brillion Zones. Diffraction of X-rays by Crystals, Bragg's Law.	**9 Hours**
Unit-2:	**Elementary Lattice Dynamics**: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains; Acoustical and Optical Phonons, Qualitative Description of the Phonon Spectrum in Solids.	**10 Hours**
Unit-3:	**Magnetic Properties of Matter:** Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia and Paramagnetic Domains. Quantum Mechanical Treatment of Para magnetism.	**9 Hours**
Unit-4:	**Dielectric and Ferroelectric Properties of Materials:** Electric Susceptibility. Polarizability Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Langevin-Debye equation. Plasma Oscillations, Plasma Frequency, Plasmons, Structural phase transition, Classification of crystals.	**10 Hours**
Unit-5:	**Superconductivity and Elementary band theory:** Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect. Band Gap, Conductor, Semiconductor (P and N type) and insulator.	**10 Hours**
Textbook:	1. G. M. Barrow: Physical Chemistry Tata McGraw Hill (2007).	
References:	1. Kotz, P. M. Treichel & J. R. Townsend: General Chemistry, Cengage Lening India Pvt. Ltd., New Delhi (2009). 2. H. Mahan: University Chemistry 3rd Ed. Narosa(1998). 3. Solid state physics by JamesPatterson 4. Introduction to solid state physics by Michel VanVeenen daal	

NOTE	Course Outcomes of following Practical's are covered in their respective theory courses.	
Course Code: BFS-S-653 SEC-16 12 HOURS	**SKILL ENHANCEMENT COURSE (SEC) FORENSIC SCIENCE SEMESTER-VI TECHNOLOGICAL METHODS IN FORENSIC SCIENCE (LAB)**	**L-0 T-0 P-2 C-1**
1	To determine the concentration of a colored compound by colorimetric analysis.	
2	To carry out thin layer chromatography of ink samples.	
3	To carry out separation of organic compounds by paper chromatography.	
4	To identify drug samples using UV-Visible spectroscopy.	
5	Electrophoretic Separation of Serum Proteins.	

Course Code: BFS-S-656 SEC-17 12 HOURS	**SKILL ENHANCEMENT COURSE(SEC) FORENSIC SCIENCE SEMESTER-VI FORENSIC TOXICOLOGY (LAB)**	**L-0 T-0 P-2 C-1**
1	Microscopic examination of Plant poisons.	
2	Color Tests for identification of poisons, drugs.	
3	To identify metallic and organic poison.	
4	Extraction methods of drugs, Poisons.	
5	To separate drugs of abuse by thin layer chromatograph.	

Course Code: BFS-S-654 SEC-18 12 HOURS	**SKILL ENHANCEMENT COURSE (SEC) FORENSIC SCIENCE SEMESTER-VI FORENSIC PSYCHOLOGY (LAB)**	**L-0 T-0 P-2 C-1**
1	To review a crime case involving serial murders. Comment on the psychological traits of the accused.	
2	To study a criminal case in which hypnosis was used as a means to detect deception.	
3	To prepare a case report on Minnesota multiphase personality inventory test.	
4	To cite a criminal case in which Narco analysis was used as a means to detect deception.	

Course Code: BFS-S-658 DSEC-6 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -A FORENSIC SCIENCE SEMESTER-VI PHYSICAL & ORGANIC CHEMISTRY II (LAB)	L-0 T-0 P-2 C-1
1.	**Inorganic Chemistry:** 1. Estimation of the amount of nickel present in a given solution as bis (dimethylglyoximato) nickel (II)or 2. Aluminium as oxinate in a given solution gravimetrically. Estimation of (i) Mg or (ii) Zn by complexometric titrations using EDTA. Estimation of total hardness of a given sample of water by complexometric titration. 3. To draw calibration curve (absorbance at λ max vs. concentration) for various concentrations of a given 4. Coloured compound and estimate the concentration of the same in a given solution. 5. Determination of the composition of the Fe3+ - salicylic acid complex / Fe2+ -phenanthroline complex in solution by Job's method. 6. Determination of concentration of Na+ and K+ using Flame Photometry.	
2.	**Physical Chemistry:** UV/Visible spectroscopy 1. Study the 200-500 nm absorbance spectra of KMnO4 and K2Cr2O7 (in 0.1 M H2SO4) and determine the λmax values. Calculate the energies of the two transitions in different units (J molecule-1, kJ mol-1, cm-1, eV). 2. Study the pH-dependence of the UV-Vis spectrum (200-500 nm) ofK2Cr2O7. 3. Record the 200-350 nm UV spectra of the given compounds (acetone, acetaldehyde, 2-propanol, acetic acid) in water. Comment on the effect of structure on the UV spectra of organic compounds. **Colourimetry:** 1. Verify Lambert-Beer's law and determine the concentration of CuSO4/KMnO4/K2Cr2O7 in a solution of unknown concentration. 2. Analyze the given vibration-rotation spectrum of HCl (g).	

Course Code: BFS-S-659 DSEC-6 12 HOURS	DISCIPLINE SPECIFIC ELECTIVE COURSE GROUP -B FORENSIC SCIENCE SEMESTER-VI SOLID STATE PHYSICS (LAB)	L-0 T-0 P-2 C-1
1	Measurement of resistivity by using 4-probe technique.	
2	Measurement of magneto resistance.	
3	Measurement of magnetic susceptibility using Quincke's method.	
4	Study of thermo luminescence of color center.	
5	Measurement of magnetic susceptibility using Gouy's method.	
6	Characteristics of Zener or Tunnel diode.	
7	Study of magnetic hysteresis.	
8	Study of Hall effect and Raman Effect.	

Course Code: BFS-S-655 SEC-19	SKILL ENHANCEMENT COURSE (SEC) FORENSIC SCIENCE SEMESTER-VI DISSERTATION	L-0 T-0 P-8 C-4
Course Outcomes:	**On completion of the course, the students will be :**	**48 hours**
CO1.	Understanding for the selection of the topic in accordance with police and forensic science problem associated with various crimes cases faced by these institutions.	
CO2.	Explaining the collection of primary data for a specific topic in one specific field.	
CO3.	Applying the concept of pilot survey relevance and to teach about specific laboratory techniques chosen by the student.	
CO4.	Analyzing a report on the basis of data and analysis undertaken.	
CO5.	Evaluating the topic of dissertation in routine Forensic Science cases.	
Course Content:		
	The students are supposed to prepare a Dissertation based on field work or laboratory work (for 1 month) in the specialized field chosen by the student in consultation with their supervisor. Two hard copies of the dissertation to be submitted by the student for its evaluation by the end of semester.